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Cup Feeding In the Neonatal ICU:  
The Influence of Country, Belief, Preference, and Past Behavior

A Dissertation Presented

by

Sameh A. Ghareeb

Submitted to the Graduate School of the  
University of Massachusetts Amherst in partial fulfillment  
of the requirements for the degree of  
DOCTOR OF PHILOSOPHY

February 2015

College of Nursing

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**Cup Feeding In the Neonatal ICU:  
The Influence of Country, Belief, Preference, and Past Behavior**

**A Dissertation Presented**

**by**

**Sameh A. Ghareeb**

Approved as to style and content by:

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College of Nursing

## **DEDICATION**

This dissertation is dedicated to my insanely large/ largely insane family who have always stood by me and dealt with all of my absence all of these years patiently, and it is dedicated to two of my advisers; this dissertation would not have been possible without them!

I dedicate this dissertation to my loving marvelous parents who have given me the opportunity of continuing my higher education. I dedicated it to my caring spectacular sisters and brothers who provided me with infinite support throughout my life since my childhood. I dedicated it to my 25 nieces and nephews who shared with me their adorable smiles and glorious prayers what sustained me thus far. Words cannot express how much I love you all!

I also dedicate this dissertation to Dr. Linda Lewandowski and Dr. Lisa Chiodo. You and I know that without your endless courage and support I would not be writing this dedication. You are very humanitarian, special, and patient professors! You have been mentors, colleagues, and friends. Your advice on both research and my career has been priceless, and your guidance has made this a thoughtful and rewarding journey!

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Thank you everybody!!! We did it!!

## **ABSTRACT**

### **CUP FEEDING IN THE NEONATAL ICU:**

### **THE INFLUENCE OF COUNTRY, BELIEF, PREFERENCE, AND PAST BEHAVIOR**

**FEBRUARY 2015**

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**Background/ Purpose:** Cup feeding has been identified as a safe alternative for preterm infants who are not able to fully breastfeed, and it has been recommended by international organizations like World Health Organization, yet the practice is limited worldwide. One potential reason this alternative is underutilized is lack of health care providers' (HCP) knowledge and negative beliefs regarding cup feeding. Jordan and the United States have different health systems, languages, cultures, and economies. A cross cultural comparison of HCP's knowledge and beliefs in these two contrasting countries may yield some interesting and valuable findings that may further inform clinicians and educators. The purpose of this study is to examine the impact of country, occupation, neonatal health care experience, and level of education on knowledge, beliefs, preference, and past behavior regarding feeding types.

**Theoretical Framework:** The Knowledge-Attitude-Behavior Model was used as guidance.

**Methods:** A non-experimental cross-cultural correlational design was used to evaluate study goals. A convenient sample of 160 neonatal nurses and physicians from US and Jordan was recruited to complete a web-based survey. Recruitment strategies included Email, website links, and snowballing. Analysis included descriptive, t-test, crosstabs, and Multiple regression analysis.



**Results:** 178 eligible participants submitted the questionnaire online. Among the respondents, 85 were from Jordan and 70 were from US. The average number of years in neonatal health care experience was 13.7 (SD = 12.3), and almost half of the participants (47.7%) had at least 10 years of neonatal health care experience. Almost half of the participants had a BSN or less (55.1%). US sample had more knowledge and positive beliefs about all feeding types, and reported higher overall cup feeding use than Jordanian sample. Physicians had more knowledge and positive beliefs regarding breast- and cup-feeding, and reported higher feeding preference and practice variables scores than nurses. Participants with at least 10 years of neonatal experience had more knowledge and positive beliefs regarding all feeding types and reported higher overall cup feeding use scores than participants with less than 10 years of neonatal experience. Participants with an advanced degree had more knowledge and positive beliefs regarding all feeding types, and they reported higher cup feeding preference and practice scores than participants with a BSN degree or lower.

**Conclusions:** US Neonatal HCPs have more knowledge and more positive beliefs about preterm infant feeding, and they prefer and use cup feeding more than Jordanian neonatal HCPs. Physicians have more knowledge and more positive beliefs regarding preterm infant feeding, and they prefer and use cup feeding more than nurses. Also, more experience leads to more knowledge and more positive beliefs regarding preterm infant feeding, and to more preference and use of cup feeding. And advanced education leads to more knowledge and more positive beliefs regarding preterm infant feeding, and to more preference and use of cup feeding.

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# CHAPTER 1

## INTRODUCTION

There is little known about nurses' and physicians' knowledge, belief, preference, and past behaviors regarding types of feeding. The focus of this research study is Neonatal Intensive Care Unit (NICU) nurses' and physicians' knowledge, belief, preference, and past behaviors regarding types of feeding stable preterm infants who are unable to fully breastfeed. The study addresses four independent (predictor) variables: Country, occupation, level of education, and neonatal care experience. The study also addresses four dependent (outcome) variables: Knowledge regarding types of feeding, beliefs regarding types of feeding, preference regarding types of feeding, and past behavior regarding cup feeding. In addition, demographic data was obtained to identify variables (i.e., covariates) that influence the relationship between the predictor and outcome variables (e.g. age, gender, health care experience, race, having children, personal experience of breastfeeding, and having/ had a preterm baby).

### Background of the Problem

**Premature infants.** The incidence of premature (preterm) birth has significantly increased in the last two decades. Globally, 9.6% of all births were preterm (i.e. 12.9 million preterm births each year). Africa has the highest rates with 11.9%, followed by North America with 10.6%, whereas Europe has the lowest rate with 6.2%. Jordan ranks as the 16<sup>th</sup> top country in preterm birth incidence, with a rate of 14.4% (i.e. 22,100 births each year). The United States (US) on the other hand is ranked the 54<sup>th</sup>, with incidence rate of 12.7% (i.e., more than 0.5 million preterm births each year; 1 of every 8 infants) (Blencowe et al, 2012; Beck et al 2010; Hamilton, Martin, & Ventura, 2009). Factors that possibly contribute to preterm birth include

maternal obesity, multiple births, delayed childbearing, use of assisted reproductive technology, births among women over 34 years of age, and Cesarean sections (Beck et al, 2010; Raju et al., 2006).

Preterm birth is the leading cause of neonatal mortality. Preterm birth complications account for 35% of neonatal deaths (UNICEF, 2014). Although the worldwide neonatal mortality rate fell from 33 to 20 deaths per 1,000 live births between 1990 and 2013, there were 2.8 million neonatal deaths in 2013, one million of them died on their day of birth. Low-income and lower-middle-income countries account for 85 % of neonatal deaths, while high-income and upper-middle-income countries account for the rest. Approximately two thirds of all neonatal deaths worldwide occur in only 10 countries; India, Nigeria, Pakistan, China, D.R. of Congo, Ethiopia, Bangladesh, Indonesia, Angola, and Kenya (UNICEF, 2014). US ranks the 148<sup>th</sup> country in neonatal mortality, with a rate of 0.4%. Jordan, on the other hand, ranks the 92<sup>nd</sup> country in neonatal mortality, with a rate of 1.1% (UNICEF, 2014).

Also, preterm birth is one of the major causes of neonatal morbidity. Cerebral palsy, sensory deficits, and respiratory illnesses are major findings associated with preterm births compared to full term infants. Neonatal morbidity may be due to ventilator-treated respiratory distress, transient tachypnea, intraventricular hemorrhage, sepsis work-ups, culture-proven sepsis, phototherapy for hyperbilirubinemia, and/or intubation in the delivery room. Prematurity has short-term as well as long-term physical, psychological and economic effects (Petrou, 2005). Long-term consequences include learning disabilities, cognitive and neurodevelopmental disorders, as well as adulthood disorders like non-insulin-dependent diabetes, coronary heart disease, and neuro-psychiatric disorders (Kaijser et al., 2009, Petrini et al., 2009; Larroque et al., 2008; McIntire & Leveno, 2008; Huddy, Johnson, & Hope, 2001).

Economically, preterm infants cost the United States more than \$26 billion yearly (U.S. News & World Report, 2012), with an average cost of \$58,000 compared to \$4,300 for a healthy full-term baby. This cost includes medical care, maternal delivery, educational services, and lost productivity associated with preterm birth (Association of Maternal and Child Health Programs, 2013).

**Feeding problems in premature infants.** Adequate nutrition is essential for growth and development of infants. This critical period of brain growth requires early postnatal feeding to avoid short- and long-term neurodevelopmental outcomes (McGuire, Henderson, & Fowlie, 2004). Having few awake-alert times; inadequate postural stability; temperature control problems; handling problems by parents; and respiratory, cardiac, or neurological problems are challenges that preterm infants have compared to full term infants. These challenges may result in inadequate milk intake, less caloric intake, inadequate hydration, and low energy stores (Cleveland, 2010; Renfrew et al., 2009). As a result, malnutrition and growth failure are complications associated with preterm infants (Herrmann & Herrmann, 2010; Cooke, Ainsworth, & Fenton, 2004).

Preterm infants are usually not able to attain total oral feeding status in the early postnatal weeks. One of the major challenges that preterm infants encounter regarding oral feeding is the presence of immature sucking and swallowing reflexes. Synchrony and coordination among sucking, swallowing, and breathing is essential for smooth, safe, and effective oral feeding (Cleveland, 2010; Lau, Smith, & Schanler, 2003). Unfortunately, this synchrony does not develop in preterm infants until 32 – 34 gestational age (GA). The lack of coordination results in increased feeding-related effort which easily tires infants during feeding, leading to a reduction in milk intake, malnutrition, and growth and development problems (Goldfield & Smith, 2010;

Rocha, Martinez, & Jorge, 2002). Even late preterm infants may have feeding difficulties. In a retrospective study done in Jordan, Abu Salah (2011) found that 15.8 % of late preterm infants had feeding difficulties compared to just 1.2% of term infants. Escobar et al (2005) found that 26% of late preterm infants' readmission to hospitals was due to feeding difficulties.

In order to ensure that adequate nutrition is provided to these preterm infants who are having oral feeding difficulties, an alternative type of feeding needs to be used until they are able to breastfeed or nipple all feeds. The most common alternative to breast or oral feeding that is used in NICUs is nasogastric tube (NGT) feeding. NGT feeding with breast milk or formula is introduced as early as possible in these infants to improve the development of the gastrointestinal (GI) system and its hormones; a benefit that parenteral nutrition would not provide. In addition, delivering breast milk through the NGT may decrease the occurrence of neonatal sepsis (de Boer & Smit, 2009).

However, one of the major disadvantages of NGT feeding is the lack of oral motor stimulation and the delayed transition from tube to full oral feeding in preterm infants (Tian-Chan et al., 2014). Another major disadvantage of NGT is the dissatisfaction of the infant's psychological and social needs as holding, eye contact, and other associated social interaction are usually not part of the NGT feeding process (Flint, 2008). Other disadvantages include increased risk for gastroesophageal reflux, aspiration, vomiting, nasal skin breakdown, dislodged or occluded feeding tube, nasal or esophageal irritation and discomfort, increased mucus secretion, partial blockage of the nasal airways, and perforation of the esophagus or the stomach (Taylor, Lillis, LeMone, & Lynn, 2010).

Cup feeding is another alternative method of feeding. Cup feeding is recommended by the World Health Organization (WHO) for preterm infants who are 32 to 36 weeks GA and

infants with oral defects until the infant is able to fully breastfeed (WHO, 2003) Cup feeding has plenty of advantages: a) may prevent nipple confusion associated with bottles, b) encourages the experience of lip and tongue movements that are not stimulated during NGT feeding, c) stimulates the olfactory nerves (smelling), lingual lipase (digestion in the mouth), and saliva, d) enhance the eye contact with the mother/ father, e) needs less energy to feed, and f) the infant can take the milk at his own pace and speed (Capital and Coast District Health Board, 2013). Despite these possible advantages, cup feeding has not been a common choice of feeding method by nurses and physicians in NICUs. This study sought to explore some of the reasons why.

**Nurses' and physicians' knowledge regarding infant feeding.** Despite the presence of a few studies that evaluated health professionals' knowledge and attitudes regarding breast feeding, there are few studies that evaluated the NICU health care team's knowledge, belief, preference, and past behaviors regarding alternative types of feeding for preterm infants (i.e. NGT, bottle, and cup feeding). One common theme of the existing studies is inadequate information about breastfeeding and other feeding methods in both physician and nursing training programs. Studies of breastfeeding found that health care providers (HCP) had very limited knowledge and skills and lacked training and education regarding breastfeeding for both healthy and NICU infants (Meier et al, 2010).

**Misconceptions and negative beliefs about feeding methods.** Studies showed that HCPs had numerous misconceptions and negative beliefs regarding breast feeding, bottle feeding, and cup feeding. These misconceptions and negative beliefs included that breastfeeding is more difficult, requires more effort, and provides less intake than bottle feeding for preterm infants (American Academy of Pediatrics, 1997; Lambert & Watters, 1998). HCPs also view cup feeding as a risk of aspiration, causes more workload, awkward, affects breast feeding, more

difficult than bottle feeding, take more time than bottle feeding, and nurses had strong feelings against cup feeding and they were not happy with how infants were fed by cup feeding (Collins et al., 2004; Aloysius & Hickson, 2007).

**Nurses' and physicians' past infant feeding experience.** There are only few studies that have described nurses' and physicians' past infant feeding experience and its relationship with knowledge, beliefs, health experience, and education. McGrath and Braescu (2004) stated that despite the presence of cues to infants' readiness for oral feeding, nursing experience played a major role in feeding practice. This study, conducted at the Regents of the University of California San Francisco Children's Hospital (McGrath & Braescu, 2004), stated that the best judges of when to start nipple feedings were experienced nurses as they were experts at feeding small preterm infants and are valuable resources for advice on feeding problems. Keefe (2010) stated that nurses in Akron Children's Hospital in Ohio had the autonomy to decide if infants show readiness to oral feeding rather than following a physician's order to oral feed these infants. Freed et al (1995) and Hellings and How (2004) found that prior personal breastfeeding experience was a significant influence on perceived effectiveness, and that nurses who had themselves breastfed were named as the most valuable source of information.

**Jordan vs. US.** There are no reported studies that have compared the views of HCPs in the U.S. as compared to the views of premature infant feeding in smaller, developing countries. Jordan and the United States are two different countries with different health systems, languages, cultures, and economies. A cross cultural comparison of health care professionals' views of infant feeding practices in these two contrasting countries may yield some interesting and valuable findings that may further inform clinicians and educators. A comparison of this type

may be useful in better understanding the field of infant feeding and in informing possible intervention studies in either country.

### **Significance of the Study**

The first 28 days of life (i.e. the neonatal period) is the most vulnerable time for a child's survival. Premature delivery accounts for one third of neonatal deaths (UNICEF, 2014). Premature infants usually encounter feeding problems in the early postnatal weeks due to the immature sucking and swallowing reflexes (Cleveland, 2010). Choosing the most appropriate method of feeding that fits preterm infants is a vital issue to be considered. Physicians and nurses have the major authority and responsibility in deciding which method to use for infant feeding in the hospital, and mothers are influenced by how the health care provider advises them (Miracle, Meier, & Bennett, 2004). The lack of sufficient training and knowledge of nurses and physicians and the misconceptions they have can create a risk of providing inadequate or inappropriate feeding choices, assistance, or advice. Also, having different cultural backgrounds and beliefs and different practices and policies to follow may affect the type of feeding the HCPs may choose for the preterm infant. Choosing inadequate or less beneficial feeding methods can become a very serious issue especially when caring for vulnerable preterm infants who are unable to breastfeed.

Although, as will be discussed below, cup feeding is a safe method of feeding preterm infants with many advantages, it is not currently a preferred method of infant feeding by mothers and most health care professionals in NICUs. The reasons for this non-adoption of a feeding practice that evidence shows is a safe and effective practice are not known. Thus, this study sought to explore and seek a better understanding of how health care professionals in two

different cultures think about infant feeding—what they know, what they recommend, what they prefer and what they report that they actually do.

By describing the knowledge and beliefs of nurses and physicians in NICUs regarding types of feeding for stable preterm infants who are unable to fully breastfeed in Jordan and comparing it to that in US, misconceptions regarding types of feeding and factors that influence cup feeding use can be identified. These findings will later lead to interventions aimed at improving the knowledge and correcting the beliefs of NICU nurses and physicians regarding types of feeding and developing models of education and support for health-care providers who work with vulnerable infants. These informed and targeted educational interventions can then improve providers' knowledge, skills, and attitudes (Bernaix, Schmidt, Arrizola, Iovinelli, and Medina-Poelinez; 2008) for health care providers in each different culture setting, and, may ultimately result in better patient outcomes for some of our most vulnerable patients: preterm infants.

## **Purpose**

The main purpose of this study is to evaluate US and Jordanian NICU nurses' and physicians' a) knowledge and beliefs regarding types of feeding, and b) preference and past behaviors regarding cup feeding stable preterm infants who are unable to fully breastfeed. Also explored were the possible effects of various demographic factors (Nurse or physician, U.S. or Jordan, amount of neonatal health care experience, level of education).



## **Aims and Hypotheses**

**Aim 1.** To identify if there are differences between US neonatal HCPs and Jordanian neonatal HCPs in regards to a) knowledge, beliefs, and preference/benefits rank regarding preterm infant feeding types, and b) past behavior regarding using cup feeding.

H1a: There is no difference between US neonatal HCP and Jordanian neonatal HCP in regards to knowledge regarding preterm infant feeding types.

H1b: There is no difference between US neonatal HCP and Jordanian neonatal HCP in regards to beliefs regarding preterm infant feeding types.

H1c: There is no difference between US neonatal HCP and Jordanian neonatal HCP in regards to preference/benefits rank of preterm infant feeding types.

H1d: There is no difference between US neonatal HCP and Jordanian neonatal HCP in regards to past behavior regarding using cup feeding.

**Aim 2.** To identify if there are differences between nurses and physicians in regards to a) knowledge, beliefs, and preference/benefits rank regarding preterm infant feeding types, and b) past behavior regarding using cup feeding.

H2a: Nurses have higher scores of knowledge than physicians regarding preterm infant feeding types.

H2b: Nurses have higher scores of beliefs than physicians regarding preterm infant feeding types.

H2c: Nurses have higher scores of preference/benefits rank of preterm infant feeding types than physicians.

H2d: Nurses have higher scores of past behavior regarding using cup feeding than physicians.

**Aim 3.** To evaluate the relation between neonatal health care experience and a) knowledge, beliefs, and preference/benefits rank regarding preterm infant feeding types, and b) past behavior regarding using cup feeding.

H3a: There will be a positive relation between higher scores of knowledge regarding preterm infant feeding types and higher rates of neonatal experience among neonatal HCPs.

H3b: There will be a positive relation between higher scores of beliefs regarding preterm infant feeding types and higher rates of neonatal experience among neonatal HCPs.

H3c: There will be a positive relation between higher scores of preference/benefits rank of preterm infant feeding types and higher rates of neonatal experience among neonatal HCPs.

H3d: There will be a positive relation between higher scores of preference and past behavior regarding using cup feeding and higher rates of neonatal experience among neonatal HCPs.

**Aim 4.** To evaluate the relation between NICU HCPs' education and a) knowledge, beliefs, and preference/benefits rank regarding preterm infant feeding types, and b) past behavior regarding using cup feeding.

H4a: There will be a positive relation between higher scores of knowledge regarding preterm infant feeding types and higher level of education among NICU HCPs.

H4b: There will be a positive relation between higher scores of beliefs regarding preterm infant feeding types and higher level of education among NICU HCPs.

H4c: There will be a positive relation between higher scores of preference/benefits rank of preterm infant feeding types and higher level of education among NICU HCPs.

H4d: There will be a positive relation between higher scores of preference and past behavior regarding using cup feeding and higher level of education among NICU HCPs.

## **Summary**

This chapter describes the issues of lack of adequate preparation and variability in nurses' and physicians' knowledge, beliefs, preference, and behaviors regarding feeding methods for preterm infants. These preterm infants lack the synchrony necessary for effective oral feeding. Nurses and physicians have the major authority in deciding which method to use for infant feeding, and mothers are influenced by how HCPs advise them. The lack of sufficient training and knowledge of nurses and physicians may create a risk of providing inadequate or inappropriate feeding choice, assistance, or advice. Also, different cultures and beliefs, and following different national/ international guidelines may affect what type of feeding HCPs choose for the preterm infant. There is little known about HCPs' knowledge, belief, preference, and past behaviors regarding types of feeding. Because of the importance of this problem, this study was conducted to evaluate US and Jordanian NICU nurses' and physicians' a) knowledge and beliefs regarding types of feeding, and b) preference and past behaviors regarding cup feeding stable preterm infants who are unable to fully breastfeed. Additionally, possible effects of amount of type of health care professional (nurse or physician), country (U.S. or Jordan), amount of neonatal health care experience, and level of education were also explored as possible co-variates.

## **CHAPTER 2**

### **LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

This chapter discusses, summarizes, and critiques the literature regarding preterm infant feeding, issues affecting choosing feeding types, cross cultural research, and conceptual definition of variables. This chapter also describes the Knowledge-Attitude-Behavior model, which provides the conceptual framework for this study.

#### **Preterm Infant Feeding**

A preterm infant is the one who is born before the 37th week (259 days) of pregnancy, counting from the first day of the last menstrual period (American Academy of Pediatrics and the American College of Obstetricians and Gynecologists, 2005). The National Institute of Child Health and Human Development recommends that infants who are born at 34 0/7 to 36 6/7 GA be considered as late preterm (Engle, 2006; Raju, Higgins, Start, & Leveno, 2006). Stable preterm infants are those who are a) born between 32 – 36 GA, b) have appropriate weight for GA, c) free of major congenital anomalies, d) free of major intracranial hemorrhage, and d) free of apnea requiring intervention or oxygen supplementation (Mizuno & Ueda, 2003). Factors that possibly contribute to preterm birth include maternal obesity, multiple births, delayed childbearing, use of assisted reproductive technology, births among women over 34 years of age, and Cesarean sections (Beck & et al 2010; Raju et al., 2006).

Preterm infants, especially those with low birth weight, have fewer nutrient reserves at birth than term infants. As a result, preterm infants are vulnerable to physiological and metabolic stressors that affect nutritional needs; such as respiratory distress, hyperbilirubinemia, temperature regulation, and infection (Cleaveland, 2010). Nutritional requirements for preterm

infants are: (a) Energy: 110-135 kcal/kg/day, (b) Protein: 3.5 - 4.5 g/kg/d, (c) Fat—4.8 – 6.6 g/kg/day, and (d) Calcium: 120-140 mg/kg/day, and e) Phosphorus: 60-90 mg/kg/day, and (f) Fluids: 135-200 ml/kg/day (Agostoni et al. 2010).

Even late preterm infants may have feeding difficulties. In a retrospective study done in Jordan, Abu Salah (2011) found that 15.8 % of late preterm infants had feeding difficulties compared to just 1.2% of term infants. Escobar et al (2005) found that 26% of late preterm infants' readmission to hospitals was due to feeding difficulties.

**Types of infant feeding.** Feeding is defined as the act of producing or supplying food (Cambridge, 2011). Feeding can be classified into three major categories: 1) parenteral feeding, 2) enteral feeding, and 3) oral feeding:

***Parenteral feeding.*** Parenteral feeding is the administration of nutrients through the intravenous route. This could be done through a central or peripheral venous access. In central venous access; a highly concentrated hypertonic nutrient solution is administered [i.e. total parenteral nutrition (TPN)]. In peripheral vein access, less concentrated TPN solutions are used. TPN is suggested to be used in premature infants who are less than 1500 grams who cannot maintain at least 60 kcal/kg/d enterally (Brine & Ernst, 2004). TPN is also used when neither oral feeding nor enteral feeding can be used (e.g. an infant with nonfunctional GI tract). In such cases, initiation of TPN is recommended during the first 24 hours of life to avoid excessive protein loss (Brine & Ernst, 2004).

However, catheter-related complications such as bacteremia, fungal infection, thrombosis, extravasation injuries, and cardiac tamponade are common consequences of parenteral feeding (McGuire et al, 2004). Metabolic complications (e.g. Cholestatic jaundice, hyperglycemia or glycosuria, vitamin deficiencies or excesses, and hyperammonaemia) and the

lack of GI stimulation are also major disadvantages of this type of feeding. Lack of GI stimulation can cause atrophy of the small intestinal mucosa and diminished concentrations of GI enzymes that accelerate maturation of intestinal motor activity in preterm infants (Brine & Ernst, 2004; McGuire et al, 2004). Given the significant risks associated with parenteral feeding, it should only be used if other feeding methods are definitely not possible.

***Oral feeding.*** There are different types of oral feeding. Each of the following types is discussed in this chapter in detail: 1) Breast-feeding, 2) bottle feeding, and 3) cup feeding.

***Breastfeeding.*** Breast feeding has well-recognized beneficial effects on both infants and their mothers, and it has both short and long term effects on the child. Breast milk has been linked with decreasing incidence of diseases and infections due to its immunological and anti-inflammatory properties that improve the immunity of the infant. Also, breast feeding enhances growth and development and bonding or closeness with infant. In addition, breast feeding decreases postpartum maternal blood loss, speeds up the involution of the uterus, and decreases the chance of postpartum depression [American Academy of Pediatrics (AAP), 2012].

Both the World Health Organization (WHO) (2014) and the American Academy of Pediatrics (AAP) (2012) recommend that infants should be exclusively breastfed for at least the first 6 months of life. After that, safe complementary foods should be given to the infant while continuing breastfeeding for almost two years. Healthy People 2020 (U.S. Department of Health and Human Services, 2012) aims to achieve higher breastfeeding rates in 2020. Healthy People 2020 includes the following goals to: (a) increase the proportion of mothers who initiate breastfeeding after birth from 74% to 82% (b) increase the number of infants who are breastfed until 6 months from 43% to 61%, and (c) increase the number of infants who are breastfed until at least the age of 1 from 23% to 34%.

In some circumstances, however, breastfeeding is contraindicated (e.g. infants with galactosemia or mothers with brucellosis) (AAP, 2014) or is a challenge for the mother, the infant, or both. Mothers of infants with medical complications reported multiple barriers to successful breastfeeding. These include both pre- and postoperative fasting restrictions, maternal stress and anxiety, fatigue, lack of privacy for milk expression or breastfeeding education, and inconsistent breastfeeding recommendations from healthcare providers (Barbas & Kelleher, 2004). Mothers also reported other reasons for not initiating or early discontinuing of breast feeding as baby was sick, mother was sick, breast milk alone did not satisfy the infant, nipples were sore or cracked, or going back to work or school (County of Los Angeles Public Health, 2010).

*Bottle feeding.* Another type of feeding is bottle feeding. Bottle feeding is one of the traditional methods of feeding used in hospitals when mothers are not able to breastfeed, especially at night (Flint, 2008). Mothers may choose formula bottle feeding at home because it is flexible and convenient. Also, if not breastfeeding, the mothers don't have to worry about what they eat or drink (Todd, 2014).

The effects of bottle feeding vary depending on the contents of the bottle. Human milk has been always preferred over formula as infant formula lacks antibodies, is expensive, and is associated with increased gas production and constipation (Homeier, 2005). Regardless of the contents of the bottle, bottle feeding has some disadvantages. Bottle feeding has been associated with safety issues. Caregivers reported aspiration as a major disadvantage of bottle feeding as bottles permit a fast flow (Keim, Fletcher, TePoel, and McKenzie, 2012) Lau & Schanler, 2000). In addition, bottle feeding has been found to be associated with otitis media (Ilechukwu et al., 2014). Furthermore, nipple confusion has been identified as a consequence of bottle feeding,

especially during the early postpartum period (Huang, Gau, Huang, and Lee, 2009; Mizuno, Fujimaki, & Sawada, 2004). Moreover, a possible inconvenience is that bottles need to be sterilized because of its rough surfaces where milk may stick and allow bacteria to grow (Baby Friendly Hospital Initiative (BFHI), 2006). In developing countries (as well as in the U.S.), inadequate facilities may exist to allow for this needed sterilization, or, some mothers may not be able to or may not take the time to do it.

*Cup feeding.* A third type of oral feeding is cup feeding. In the process of cup feeding (figure 1), a 30 cc medicine cup, that is at least half full with breast milk or formula, is used to feed the baby who is sitting in a supported upright position. The brim of the cup is placed at the outer corners of the upper lip and resting gently on the lower lip with the tongue inside the cup, then the cup is tipped so the milk is just touching the baby's lips. The infant usually laps the milk, or may sip it (Kaiser Permanente, 2008).



*Figure 1.* Cup feeding.

Cup feeding is not a new method of infant feeding. Cup feeding was first evaluated in 1948 at the University of Kansas Medical Center and was associated with increases in weight. Researchers found cup feeding suitable for premature infant and infants with oral defects such as cleft lip or cleft palate (Davis, Sears, Miller, & Brodeck, 1948; Fredeen, 1948). In addition, cup feeding has been used in developing countries for decades; it is recommended by the WHO in



developing countries where sanitation is a major issue as it is easier for mothers to clean a cup than it is to adequately clean bottle pieces (e.g., nipples and rings) or sterilize the bottles (Dowling 2002; Lang 1994).

Recently, cup feeding has been introduced more frequently as an alternative feeding method in maternity and neonatal units for preterm and term infants who are unable to fully breastfeed (Flint, 2008). Indeed, the WHO and the Baby Friendly Hospital Initiative (BFHI) recommend the use of cup feeding for infants 30-32 weeks GA, who are able to swallow but cannot suckle, once or twice a day while the infants are still having most of their nutrition by tube, so that no artificial nipples are introduced to these infants. If infants tolerate cup feeding well, NGT feeding (and its associated risks) can be reduced (BFHI, 2006; WHO, 2003; WHO 1993).

There are several advantages of cup feeding that nurses and physicians may or may not be aware of. First, the preterm infant can be fed by a cup as early as 30 weeks GA, prior to the ability to breast or bottle feed (Lang et al., 1994). Second, cup feeding allows the infant to control the amount and rate of feeding. Third, cup feeding encourages coordinated breathing, sucking/ lapping, and swallowing in the neonate. Fourth, cup feeding results in a positive parental involvement which fosters early positive body/eye contact resulting in the development of positive parent-child attachment (BFHI, 2006; Dowling et al., 2002). Fifth, cup feeding has been found to be associated with increases in weight with less risk of major complications compared to NGT feeding (Dowling et al., 2002). Sixth, by using cup feeding, the infant has the chance to use the tongue and will be able to taste the milk/ formula provided which enhances the newborn's ability to develop tasting and sucking actions that are necessary for breastfeeding, unlike in NGT where the milk/ formula pours directly into the stomach. Seventh, cup feeding

avoids the nipple confusion caused by bottle feeding (Dowling et al., 2002). The latter two advantages increase the likelihood that preterm infants who are cup fed will be fully breastfed at discharge (BFHI, 2006; Collins et al., 2004; Dowling et al., 2002; Ritchie, 1998).

Although cup feeding has many advantages, cup feeding is not widely used by health care professionals in hospitals. Staff in the U.S. has reported strong feelings against the use of cup feeding stating that the procedure is “awkward” and increases nurse workload (Collins et al., 2004; Lang et al. 1994). In addition, inappropriate cup feeding techniques used by staff, such as pouring the milk rather than letting the infant to lap the milk, are connected with higher rates of aspiration pneumonia (Lang et al., 1994). Thus, this complication may also decrease staff enthusiasm for this type of feeding.

***Enteral Feeding.*** An alternative method of feeding that is traditionally used in NICUs when oral feeding is a challenge is enteral feeding (Flint, 2008). Enteral feeding is the administering of formula or breast milk through a tube that is passed directly into the GI tract to improve caloric intake (Taylor, et al., 2008). Enteral feeding could be provided for a short or long term use. In short-term use, a naso-gastric tube (NGT) is inserted through the nose into the stomach or into the upper portion of the small intestine. Radiographic examination is used to verify initial placement of feeding tubes (Taylor, et al., 2008). In most NICUs, preterm infants receive NGT feedings until they are able to move to breast or bottle feeding (Arvidson, Clark, Lazarus, & Schooling, 2010). In long-term use, a tube is inserted surgically through an opening either into the stomach (i.e. Gastrostomy) or into the jejunum (i.e. jejunostomy) (Taylor, et al., 2008).

Early infant feeding has been found to be important to infant growth and well-being. Introduction of enteral feeding used to be delayed in sick very low birth weight infants with HCPs thinking to decrease the risk of developing neonatal necrotizing enterocolitis. However, it is now known that delaying feeding can cause lack of GI stimulation which, as stated earlier, may cause atrophy of the small intestinal mucosa (Brine & Ernst, 2004; Ziegler, Thureen, & Carlson, 2002). Studies have compared preterm infants who received early introduction of enteral feedings and these who received solely TPN. These studies found that early introduction of enteral feedings, even with small amounts (i.e. 5-25 ml/kg/day): a) decreased the amount of time to reach full feedings, b) decreased the number of days that feedings were held due to clinical signs of feeding intolerance, c) reduced length of hospitalization, d) decreased the incidence of developing sepsis, and e) improved growth (Brine & Ernst, 2004; Terrin et al., 2009).

### **Cup Feeding Use**

There are no reported studies that evaluate rates of cup feeding use in Jordan, US, or worldwide. However, it has been reported that cup feeding has been used worldwide in both developing and developed country.

Ezeonodo (2013) reported that cup feeding has been widely used both in maternity wards and in neonatal units in Nordic countries (Norway, Sweden and Denmark). Midwives and neonatal nurses in these countries are trained to use cup feeding, and parents are usually trained to cup feed from first day possible. In Finland, cup feeding is used in many maternity wards, but not in NICUS (Ezeonodo, 2013). Cup feeding is also recommended by the Australian Breast Feeding Association (ABFA) for premature infants to avoid nipple confusion associated with bottle feeding (ABFA, 2014)

In a paper done by Bandara, Nyqvist, Musmar, Procaccini, and Wang (2012) that included a discussion between 5 HCPs (2 with RN PhD degree, 1 with RN MSN degree, and 2 with MD) from 5 countries (Sri Lanka; NJ, US; Palestine; Sweden, and Taiwan), HCPs revealed different uses of alternative feeding methods in these countries.

The MD from Sri Lanka stated that bottle feeding was not used in their hospital and cup feeding is one of the main alternatives to breast feeding in their unit, also noting that parents were trained how to cup feed on discharge, and, although mothers often were scared to use cup feeds initially, most became comfortable with some training. The RN MSN from US stated that despite the availability of cup feeding, syringes, tubes at the breasts, and spoons as alternatives to breast feeding, bottle feeding was the preferred method to use by nurses and mothers. The MD from Palestine indicated that cup feeding was not used in their units, and NGT is used till the infant is able to suckle. The RN PhD from Sweden stated that cup feeding was the first choice for oral feeding after breastfeeding, bottle feeding is not an option but an exception, and fathers appreciated the chance to feed their baby by cup in the mother's absence. The RN PhD from Taiwan stated that NGT and bottle feeding are the main alternatives used in their units, and parents prefer bottle feeding over cup feeding for longer use (Bandara et al., 2012).

### **Readiness of the Infant for Oral Feeding**

A number of factors determine the appropriate time for oral feedings to begin in a premature infant. Transitioning from tube feedings to independent oral feeding depends on many conditions, neonatal illnesses is one of them (Callen & Pinelli, 2005). Some medical procedures (e.g., intubation, tube feeding, and suctioning) may affect sucking and swallowing development, as well as oral sensory and motor dysfunction (Arvedson et al., 2010). The infant's ability to

achieve awake status and the absence of apnea are other factors that affect readiness for oral feeding as well (Dewier, 2012).

Gestational age (GA) is another factor that affects preterm infants' readiness to oral feeding. As mentioned previously, the WHO and the BFHI recommend the use of cup feeding in preterm infants as early as 30 weeks GA. This recommendation is based on the fact that preterm infants are able to swallow at this age.

Nurses and physicians play an important role in assessing the preterm infant feeding behavior and readiness for oral feeding (Dewier, 2012). Assessment includes preterm infant's history taking and physical exam, developmental assessment, respiratory rate, heart rate, color changes, nasal flaring, suck-swallow-breathe coordination, quantity of intake, infant positioning, and observation of non-nutritive sucking (NNS) and swallowing (Dewier, 2012). There are some instrumental evaluation procedures that can be used when needed to further evaluate the feeding readiness or its barriers. These instruments include a video fluoroscopy swallow study, flexible endoscopic evaluation of swallowing, and ultrasonography (Dewier, 2012). Ultrasound studies revealed that NNS and swallowing are developed in fetuses by 15 weeks gestation. Forward tongue thrusting has been reported by 21 weeks gestation, tongue cupping at 28 weeks gestation, and suckling between 18-24 weeks gestation (Arvedson & Delaney, 2008). These ultrasound findings confirm readiness of preterm infant for cup feeding. However, it is unclear if this information is known by most nurses and physicians in NICUs in relation to cup feeding.

Mizuno and Ueda (2003) studied sucking efficiency, pressure, frequency, duration of feeding, and timing of swallowing in 24 stable preterm infants at 32 - 36 GA, 4 – 8 weeks after birth. They found that sucking efficiency significantly increased between 34 and 36 weeks. They

also found that there were significant increases in sucking pressure, frequency, and duration between 33 and 36 weeks. Regarding timing of swallowing, they found that swallowing occurred during pauses in respiration at 32 and 33 weeks, whereas swallowing occurred at the end of inspiration after 35 weeks. Another study by Nyqvist, Farnstrand, Olofsson, and Ewald (2001) found that physiologically stable preterm infants initiated breastfeeding at a median age of 33.7 weeks age, achieved first nutritive sucking at median age of 34.3 weeks, and achieved exclusive breastfeeding at about 36.0 weeks. These studies suggest that readiness for breast/ bottle feeding that necessitate effective sucking is not as early as readiness for cup feeding.

### **Early Introduction of Oral Feeding**

Early introduction of oral feeding to preterm infants has been found to have a number of benefits. It enhances chances of being fully breastfed sooner; improves rates of early discharge, and increases rates of breast feeding at discharge (Simpson, Schanler, & Lau, 2002). Simpson, Schanler, and Lau, (2002) randomly assigned 29 infants, who were less than 30 weeks GA, into two groups. One group ( $n = 13$ ) started oral feeding 48 hours after achieving full tube feeding (120 kcal/kg/d), and the other group ( $n = 16$ ) started oral feeding according to the discretion of their attending physicians. It was found that by starting oral feeding within 48 hours of achieving full tube feeding, preterm infants switched completely from tube to oral feeding two weeks earlier than the other group ( $M=34.5$ ,  $SD=1.6$  vs.  $M=36.0$ ,  $SD=1.5$  weeks' GA,  $p<0.05$ ), and, they were discharged from the hospital 10 days earlier than the other group ( $M=57$ ,  $SD=18$  days vs.  $M=67$ ,  $SD=17$  days,  $p = 0.13$ ). Because cup feeding can be started before bottle or breast feeding, as stated earlier, initiation of cup feeding, as early as the infant is ready, can reveal positive outcomes in regards to earlier breastfeeding and earlier discharge.

## **Early Oral Stimulation**

Early oral stimulation has a number of positive benefits. “Early Oral Stimulation” consists of providing finger touches to cheeks, lips, gums, and tongue followed by a pacifier dipped in milk or formula while being fed by NGT. This therapy increases time in alert states, slowly trains preterm infants how to suck, and associates the taste of breast milk or formula with the sensation of a full stomach. It also helps preterm infants’ transition from tube feeding to full oral feeding sooner; which means an earlier discharge to home (Martin, 2013). Tian-Chan et al. (2014) evaluated the effect of an oral stimulation program on preterm infants. Researchers randomly divided 72 preterm infants to two groups; one received routine care while the other one received oral stimulation in addition to routine care. It was found that the preterm infants who had oral stimulation transferred to full oral feeding sooner with higher feeding efficiency ( $p < 0.05$ ) compared to preterm infants with routine care. Bache, Pizon, Jacobs, Vaillant, and Lecomte (2014) conducted a similar study on 86 preterm infants. Researchers found that preterm infants who received oral stimulation had higher rates of breastfeeding upon discharge were significantly higher in the intervention than in the control group (70% versus 45.6%,  $p=0.02$ ).

Cup feeding also produces a form of oral stimulation. Oral stimulation includes finger touches to cheeks, lips, gums, and tongue, and this is exactly what we do when the rim of the cup touches the lower part of the tongue. Cup feeding includes placing the rim of the cup on the lower lip under the tongue (Kaiser Permanente, 2008). This stimulates lips, cheeks, gum, and tongue.

## **Cup Feeding Versus Other Alternative Types of Feedings**

There are many studies that have compared cup feeding to other alternative types of feeding in regards to effects on oral activities, breastfeeding proportion at discharge and after

discharge, length of hospital stay, length of feeding , physiological stability, and amount of milk ingested and weight gain. Collectively, they demonstrate advantages and benefits of this type of under-used feeding method.

**Effects on oral activities.** Studies showed that cup feeding has similar effects on oral activities as breast feeding. In a classic study, Davis, Sears, Miller, and Brodeck (1948) assessed the effects of cup feeding, bottle, and breast feeding on oral activities of newborn infants; they divided 60 babies into three groups of 20: one fed by cup, one fed by bottle, and one fed by breast. It was found that cup fed infants developed a sucking reflex as strong as the sucking reflex in infants in the other two groups during the first 10 days of life. That was probably due to the tongue movement during cup feeding.

In more recent studies, electromyography (EMG) has been used to evaluate infant sucking behavior. Nyqvist and Ewald (2006) stated that there are similarities between the wider range and mean contraction of the masseter and temporalis muscles in breastfed and cup-fed infants, compared with bottle-feeding. These similarities make cup-feeding a better alternative oral feeding method than bottle feeding. Also, França, Sousa, Aragão, and Costa (2014) found that the levels of masseter muscle activity during cup-feeding were between those of breast and bottle feeding, and they recommended cup feeding over bottle feeding as a temporary substitute for breastfeeding.

Several instruments have been developed to assess sucking competence and behavior such as the Infant Breastfeeding Assessment Tool and the Five Types Sucking Behavior Tool. Huang, Gau, Huang, And Lee (2009) conducted a longitudinal study on 250 healthy term infants. Infants were distributed into three groups; cup, bottle, and breast. Researchers used both tools mentioned above, and found that there are no differences between the groups in the sucking



competence (Breast:  $M=8.79$ ,  $SD=0.35$ , Bottle:  $M=8.69$ ,  $SD=0.45$ , Cup:  $M=8.21$ ,  $SD=0.37$ ) or in the sucking behavior.

These similarities between cup feeding and breast feeding in regards to oral activities and sucking competence and behavior make cup-feeding a better alternative oral feeding method than other types of feeding used in NICUs. Yet, it is under-utilized or not used at all in many units, especially in the U.S. This study sought to explore some reasons why.

**Effects on breast feeding proportions.** Cup feeding has been found to enhance breast feeding proportions at hospital discharge and after discharge compared to bottle feeding. Yilmaz, Caylan, Karacan, Bodur, and Gokcay (2014) randomly assigned 522 preterm infants, who were 32-35 weeks GA to 2 groups: cup-fed and bottle-fed groups. It was found that cup feeding significantly increased the likelihood of preterm infants being exclusively breastfed at discharge (72% vs. 46%,  $p<0.0001$ ), at 3 months (77% vs. 47%,  $p<0.0001$ ), and at 6 months after discharge (57% vs. 42%,  $p<0.01$ ). In another study that had almost similar results, Collins et al. (2004) randomly distributed 319 preterm infants to one of four groups: cup/no dummy, cup/dummy, bottle/no dummy, and bottle/dummy. It was found that cup feeding, compared to bottle feeding, significantly increased the rates of breastfed at discharge ( $M=1.04$  vs.  $M=2.88$ ,  $P=0.03$ ). It was also found that cup feeding increased rates of breastfed at 3 months after discharge ( $M=0.77$  vs.  $M=2.23$ ,  $P=0.33$ ) and at 6 months after discharge ( $M=0.81$  vs.  $M=2.57$ ,  $P=0.22$ ), but these two findings were statistically non significant. The statistically non significant results in the study could be due to the non-compliance of mothers to the assigned group intervention. The researchers found a high non-compliance (56%) for cup feeding among mothers as they introduced bottle to the preterm infant feeding as well (Collins et al, 2004).

There are no reported studies that specifically explored mother's comfort levels, concerns, fears, about cup feeding; an important topic that needs to be further explored.

In another study that evaluated breast feeding proportions after discharge, Abouelfettoh, Dowling, Dabash, Elguindy, and Seoud (2008) assigned 60 preterm infants into two groups; cup and bottle groups, to evaluate effects on breastfeeding outcomes after discharge. Both groups were followed up after discharge for six weeks to evaluate infant's breastfeeding behavior and mother's breastfeeding practices. Data showed that cup fed infants were more exclusively breast fed one week after discharge than bottle fed infants, and that cup fed infants demonstrated significantly more mature breastfeeding behaviors over six weeks. Also, Brown, Alexander, and Thomas (1999) conducted a retrospective study on 63 full term breast-feeding babies; 30 supplemented by cup and 33 supplemented by bottle. There appeared to be a higher breast-feeding rate in the cup as compared with the bottle-feeding group, but it was not statistically significant (70% vs. 55%,  $p = 0.30$ ).

Seemingly different results were found, however, in an earlier study. Garpiel (2012) compared cup, bottle, and NGT by dividing 132 preterm infants 26 – 36 weeks GA into four groups: NGT with pacifier, bottle with preterm nipple, cup feeding with a 30 ml medicine cup, and the Haberman infant feeder (i.e. one way valve squeezable bottle). The researcher found that preterm infants in the NGT with pacifier group had significantly better breastfeeding ability at discharge than the other groups, and continued breastfeeding to 4 weeks after discharge. But, using the pacifier could be a factor that affected the results of this study. Also, the researcher did not mention in the results the effects of other types of feeding used in the study on breast feeding proportions.

**Effects on length of stay in the hospital.** There appears to be no clear advantage or disadvantage of cup feeding when it comes to length of stay in the hospital. Yilmaz et al. (2014) did not find significant difference between cup feeding and bottle feeding groups in regards to length of hospital stay (Bottle:  $M=25.96$ ,  $SD=2.20$  vs. Cup:  $M=25.68$ ,  $SD=2.22$ ). Also, Brown, Alexander, and Thomas (1999) found no significant difference in the length of time from the beginning of supplementation to leaving hospital (Cup Median=12 days vs. Bottle Median=11 days,  $p=0.46$ ). Similarly, Garpiel (2012) found no significant differences in hospital length of stay among the four methods they evaluated (i.e., NGT with pacifier, bottle with preterm nipple, cup feeding with a 30 ml medicine cup, and the Haberman infant feeder).

However, Collins et al (2004) found that preterm infants who were cup fed had longer length of stay in the hospital than bottle fed group ( $M=59$  vs.  $M=48$ ,  $p=0.01$ ). But again, the poor compliance in the study reduces the power of the trial to identify a real treatment effect, and researchers were unable to determine if the results were due to the low compliance or to lack of efficacy of cup feeding Collins et al (2004).

**Effects of feeding method on amount of time per feeding.** Most studies found that cup feeding does not require more time to feed than bottle feeding. To compare administration time during cup-, bottle-, and breastfeeding; Howard et al. (1999) randomly assigned 98 full term, healthy newborns to either cup-feeding or bottle-feeding, and then compared them to 25 breastfed term infants. It was found that the length of feeding and burst time were actually longer in breast feeding than that in cup feeding and bottle feeding, and there was no significant differences between bottle feeding and cup feeding groups with regard to time spent feeding. Also, Rocha, et al. (2002) compared 34 preterm infants who were bottle-fed and 44 preterm infants who were cup-fed and found that the time spent administering milk by bottle or cup did

not differ between groups [Bottle:  $M=13.4$ ,  $SD=4.8$  (Range 6-25) vs. Cup:  $M=11.8$ ,  $SD=4.5$  (Range 5-25)]. Similarly, Huang and associates (2009) found similar results in their longitudinal study on 250 healthy term infants, where infants were distributed into three groups; cup, bottle, and breast (Bottle:  $M=11.2$ ,  $SD=5.1$  vs. Cup:  $M=9.7$ ,  $SD=4.9$ ). Also, Yilmaz and associates (2014) found similar results in their study on 522 preterm infants, who were 32-35 weeks GA, who were distributed into 2 groups: cup-fed and bottle-fed groups (Bottle:  $M=13.6$ ,  $SD=1.6$  vs. Cup:  $M=13.7$ ,  $SD=1.7$ ,  $p=0.32$ ).

Alternatively, in one another study, bottle feeding was found to require less time than cup feedings. Marinelli, Burke, and Dodd (2001) conducted a prospective, randomized crossover study on 56 infants who were less than 34 weeks GA. These preterm infants were randomly assigned to which type of feeding to start and which one to follow; cup feeding or bottle feeding. It was found that duration of feeds were longer during cup feeding, with a mean of 20.1 minutes ( $SD=5.9$ ) for each feeding, compared to 16.3 minutes for each feeding during bottle feedings ( $SD=5.5$ ,  $p=0.002$ ).

The study of Marinelli et al (2001) differs from other studies in regards to length of feeding in that it used a cross over design. So, for example, using bottle feeding first followed by cup feeding could initiate a feeding confusion to the infants which might affect the results. Also, HCPs should not solely rely on this only study to support their beliefs that cup feeding is slow and time consuming, as other studies showed different results. Moreover, and importantly, the difference between cup feeding time and bottle feeding time was around 4 minutes. Although statistically significant, 4 minutes sounds a very short time compared to the benefits the infant will get from cup feeding. Nevertheless, this difference in results compared to the previous studies that found no difference between cup feeding and bottle feeding necessitate further

studies that recruit alike samples, use same methodology, use same kinds of bottles with same flow rates, and feedings to be administered by well trained staff.

**Effects of feeding method on physiological stability.** There are only a few studies that have assessed the effect of cup feeding and bottle feeding on heart rate (HR), respiratory rate (RR), and oxygen saturation (SpO<sub>2</sub>).

Studies done on preterm infants found that cup feeding provides more physiological stability for preterm infants compared to bottle feeding. Marinelli et al. (2001) studied 56 infants who were less than 34 weeks GA, and assessed HR, RR, and SpO<sub>2</sub> each minute for ten minutes before and during the feedings. The researchers found that (1) episodes of desaturation < 90 % in bottle feeding were ten times more than that in baseline, while they remained unchanged during cup feeding, (2) the lowest SpO<sub>2</sub> reading for bottle fed infants was lower (74 %) than that in cup feeding (90%), (3) the mean SpO<sub>2</sub> was lower in bottle feeding than that in cup feeding ( $94.5 \pm 5.3$  vs.  $96.5 \pm 2.6$ ;  $p=0.02$ ), (4) the average HR was higher in bottle feeding compared to cup feeding ( $171.8 \pm 10.9$  vs.  $168.4 \pm 11.1$ ;  $p=0.009$ ), and (5) no significant differences in RR between cup and bottle groups. Also, Rocha and associates (2002) found that cup-feeding significantly decreased the incidence of desaturation episodes of <85 % compared to bottle feeding (13.6% vs 35.3%,  $P=.02$ ), but did not compare HR or RR.

This desaturation finding was not, however, found in a study of full term infants. Howard et al. (1999) monitored HR, RR, and SpO<sub>2</sub> in the cup, bottle, and breast feeding groups in 98 full term infants. They found no significant differences in HR, RR, and SpO<sub>2</sub> between the cup and bottle groups, but HR and RR were lower and SpO<sub>2</sub> was higher in the breast feeding group compared to cup and bottle. Thus, it may be that this desaturation effect is a finding in premature, but not full-term infants.

**Effects of feeding method on amount of milk ingested and weight gain.** Most studies found no effect of cup feeding on decreasing amount of milk taken by infants or reducing weight gain. In full term infants, Howard et al. (1999) found no significant differences in amounts ingested during feeding in cup feeding ( $M=1.04$ ,  $SD=0.48$ ) or bottle feeding groups ( $M=1.26$ ,  $SD=0.58$ ). Similarly, Brown et al. (1999) found no significant difference in the amount of milk ingested; in cup feeding it ranged from 1 to 60 ml ( $M=28.4$ ) and from 10 to 60 ml in bottle feeding ( $M=33.9$ ,  $p=0.15$ ). Weight gain is an indirect indicator of milk ingestion; low ingestion of milk would cause low weight gain. Studies on preterm infants showed no negative effects of cup feeding on weight gain. Yilmaz et al. (2014) found that weight gain within the first 7 days were similar in bottle and cup feeding groups (Bottle  $M=16.8$  g/kg/day,  $SD=1.5$ . Cup  $M=16.7$ ,  $SD=1.5$ ). Rocha, et al. (2002) had very similar results in their study when they compared 34 preterm infants who were bottle-fed and 44 preterm infants who were cup-fed, and found no difference in the amount of milk ingested between the two groups (Bottle  $M=14.7$  g/kg/day,  $SD=5.6$ . Cup  $M=14.1$ ,  $SD=6.1$ ).

However, one study done on preterm infants by Marinelli, et al. (2001) found that the volume of milk taken and fraction of the feed taken (volume taken /volume prescribed in milliliters) was higher in bottle feeding than that in cup feeding (Volume:  $M=27.2$ ,  $SD=11.7$  vs.  $M=20.9$ ,  $SD=11.3$ ,  $p=0.004$ . Fraction:  $M=0.76$ ,  $SD=0.3$  vs.  $M=0.61$ ,  $SD=0.3$ ;  $p=0.003$ ). Marinelli and associates explained the difference between their findings and the findings of Howard et al. (1999) and Brown et al. (1999) by noting that preterm infants are less developmentally mature and have reduced efficiency of feeding abilities than full term infants, making it normal to have less intake of milk than what full term infants takes (Marinelli, et al., 2001).

## **Summary: Infant Feeding**

Feeding can be classified into three major categories: 1) parenteral feeding (i.e. administration of nutrients through the intravenous route), 2) enteral feeding (administering of formula or breast milk through a tube that is passed directly into the GI tract), and 3) oral feeding (Breast-, Bottle-, and cup-feeding). Exclusive breast feeding is recommended by the WHO and the AAP for the first 6 months of life because of its benefits for both the mother and the infant. However, in some circumstances, breastfeeding is contraindicated or is a challenge for the mother, the infant, or both. Consequently, alternative types of feeding are necessary to provide the required nutrition.

Despite of its multiple disadvantages, preterm infants receive NGT feedings in most NICUs until they are able to move to breast or bottle feeding. Bottle feeding is one of the traditional methods of feeding used in hospitals despite its reported disadvantages like safety issues, aspiration, otitis media, and sanitization.

On the other hand, cup feeding has been found to have many advantages such as: can be used as early as 30 weeks GA, infant can control amount and rate of feeding; encourages coordinated breathing lapping, and swallowing; parental involvement; satisfactory weight gain; tongue involvement; and avoidance of nipple confusion. Cup feeding has been compared to other alternative types of feeding in many studies; collectively, these studies described in the above section demonstrated advantages and benefits for cup feeding over other types. Cup feeding has similar effect on oral activities as breast feeding. Also, cup feeding enhances breast feeding proportions at hospital discharge and after discharge compared to bottle feeding. In addition, cup feeding has similar effects as bottle feeding on preterm length of stay in hospital. Moreover, most studies found that cup feeding does not require more time to feed than bottle feeding and provides more physiological stability to preterm infants compared to bottle feeding.

Additionally, cup feeding has similar effects as bottle feeding on amount of milk taken by infants and weight gain.

Still, despite the fact that cup feeding is safe and has many advantages, it is not a preferred method of infant feeding by mothers and most health care professionals in NICUs. The reasons for this non-adoption of what evidence shows is a safe and effective practice—one that appears to even have some advantages for preterm infants, are not known. Thus, this study sought to explore and seek a better understanding of how health care professionals in two different cultures think about infant feeding—what they know, what they recommend, what they prefer and what they report that they actually do. Knowing more about these areas will help to identify possible misconceptions, educational needs, biases, or other factors that may have an impact on health professionals' adoption of cup feeding for preterm infants.

### **Issues Affecting Choosing Feeding Types**

The next section will discuss what is known in relation to some of the issues that may affect the decision of HCPs and parents regarding choosing a type of feeding, such as misconceptions, negative beliefs, experience, and country of residence.

**Mother's Use, Preference, and Negative Beliefs Regarding Cup Feeding.** Although cup feeding has some physiological and possible psychosocial benefits to offer preterm infants, a study by Collins and associates (2004) showed that mothers were not eager to embrace this method of feeding. The study found that there was a high non-compliance (56%) to cup feeding among mothers who were assigned to cup feeding groups. Mothers of these infants introduced bottle, pacifier, or both when they were, by treatment plan, supposed to be cup feeding their infants. Mothers reported that some of their reasons for not exclusively using cup feeding were: (a) the advice of the nurse/midwife, (b) mothers did not like it, (c) mothers had problems with it (d) infant was not managing cup feeds, (e) infant was spilling a lot, (f) infant was not being



satisfied, or (g) it was taking too long to feed. Primiparous, higher educated women, whose household income was from full time work from either partner, and who had a singleton infant > 28 weeks GA were more likely to have complied with the study protocol by continuing to cup feed (Collins et al., 2004).

**Nurses' and Physicians' Knowledge Regarding Infant Feeding.** Studies of breastfeeding have found that health care providers (HCP) have very limited knowledge and skills and lack training and education regarding breastfeeding for both healthy and NICU infants (Meier et al, 2010).

A few studies assessed physicians' knowledge and attitudes of physicians regarding breast feeding, the majority of them found knowledge deficit among physicians. Guise and Freed surveyed 107 family medicine and pediatric resident physicians from three large, hospital-based public and private programs in North Carolina. They found a knowledge deficit regarding the relationship between breast feeding and growth. Yan-qiong, You-xian, and Qing (2012) investigated knowledge of and beliefs about breastfeeding among 367 Chinese female physicians, and they found breastfeeding-related knowledge was surprisingly poor, and attitudes negative. Brodribb (2008) examined attitudes and knowledge of 161 Australian final year residents. The mean attitude score was 3.99/5 and the mean knowledge score was 3.4/5, however, 40% of the knowledge items were answered incorrectly by the majority of participants. Freed and associates (1995a) found that there were significant deficits in knowledge of breastfeeding benefits and clinical management in both residents and practicing obstetrician-gynecologists. Reasons for this deficiency were described in few studies. In a study of resident physicians by Freed and associates (1995a), 73% of participants rated their residency training as inadequate preparation to promote breastfeeding, noting a lack of breastfeeding topics presented

by obstetric faculty. Eden, Mir, and Srinivasan (2000) surveyed program directors of every accredited pediatric residency program in the US ( $n = 209$ ) and found that 45% of the respondents rated the quality of their breastfeeding education as only moderate or below. Also, Schanler, O'Connor, and Lawrence (1999) found that only 58% of pediatric residents received education on breastfeeding management while in medical school or during their residency, and 86% of pediatric residents would like to receive additional education on breastfeeding management. Pediatric residents referred to nursing staff as sources for breast-feeding education (Freed et al, 1995a).

Few studies assessed nurses' knowledge regarding breast feeding. Fraser, Keogh, McLaughlin, and Young (2001) surveyed 241 pediatric nurses in Australia and found that participants demonstrated excellent breastfeeding attitudes and general knowledge but deficits in breastfeeding knowledge related to specific outcomes, like lactogenesis, associated hormones, factors associated with attachment, audible swallowing, slow deep and rhythmic jaw action and a relaxed infant while feeding. Pantazi, Jaeger, and Lawson (1998) evaluated pediatric and neonatal nurses and midwives regarding support for breastfeeding mothers. They found that 53% of pediatric staff had no relevant training in breastfeeding, and had inadequate knowledge of lactation despite the frequent assistance they provided to mothers to breastfeed their infants.

Nursing students have also shown some knowledge deficit regarding breast feeding. Ahmed, Bantz, and Richardson (2011) surveyed 115 nursing student from two schools of nursing in two Midwestern universities who completed maternal/child nursing didactic and clinical courses. Findings revealed a mean knowledge score of  $17 \pm 2.9$  (total possible score 24). Participants scored the lowest on physiology of lactation and breastfeeding management. Freed and associates (1996) assessed the knowledge of nursing students in the final year of their

nursing programs (both Bachelor of Science Degree in Nursing and Associate Degree programs). The vast majority, 93%, reported having received at least one lecture on breastfeeding; however, only 25% received breastfeeding-related experience during clinical activities. Anderson and Geden (1991) also noted that nurses received insufficient education and training to effectively support breastfeeding mothers.

Hellings and How (2004) similarly found that pediatric nurse practitioners lacked knowledge about specific management strategies of breast feeding, and reported themselves to be less effective in providing breastfeeding assistance than did their pediatric physician colleagues. However, they showed a more supportive attitude and better knowledge regarding breast feeding than pediatric physicians.

**Misconceptions and negative beliefs regarding feeding types.** Studies showed that HCPs had numerous misconceptions and negative beliefs regarding breast feeding and bottle feeding of preterm infants. There is a common misconception that breastfeeding is more difficult and requires more effort than bottle-feeding for preterm infants. Mothers of preterm infants often are discouraged to breastfeed; and bottle feeding is both a routine and essential aspect of hospital care (American Academy of Pediatrics, 1997). Mothers were given negative advice regarding breast feeding, such as: "The bottle is easier", "It's harder to breastfeed", "Formula has more calories", and "give it up, there was no sense in trying", and "The baby would have better intake from a bottle". (Lambert & Watters, 1998).

HCPs also had several misconceptions and negative beliefs about cup feeding. In a systematic literature review done by Flint (2008), it was stated that infants are "at higher risk of aspiration pneumonia". This misconception could be due to the improper technique used to cup feed infants by pouring the milk into the infant's mouth rather than allowing the infant to 'lap' or

sip the milk (Thorley 1997). Flint (2008) also stated that “nursing workload may be increased”, “term infants may refuse the breast”, and “term infants may become addicted to the cup if used for prolonged time”. In addition, Collins et al. (2004) stated that some of the staff in the study had strong feelings against cup feeding, and some parents did not like cup feeding. Moreover, Aloysius and Hickson (2007) compared cup feeding versus bottle feeding in 15 preterm infants who were > 32 weeks GA at time of observation. Nurse's attitudes to the feeding method were self-rated by questionnaire on a three point scale for: efficiency, time taken, state of the baby during and after a feed, ease of feeding, and nurse satisfaction. Nurses reported that cup feeding had more spillage (73.3% vs. 20%,  $p=0.003$ ), slower (73.3% vs. 40.0%,  $p=0.07$ ), and more difficult (60.0% vs. 33.3%,  $p=0.14$ ) than bottle feeding. Also, 11 nurses (73.3%) reported that they were not happy with how infants were fed in the cup feeding group compared to 4 nurses (26.7%) in the bottle feeding group ( $p=0.01$ ).

### **Nurses' and Physicians' Past Infant Feeding Experience**

There are only few studies that have described nurses' and physicians' past infant feeding experience and its relationship with knowledge, beliefs, health experience, and education regarding feeding types. In their study of 241 pediatric nurses in Australia, Fraser and associates (2011) found a strong relationship between experience with neonates/infants and higher levels of knowledge. McGrath and Braescu (2004) stated that despite the presence of cues to infants' readiness for oral feeding, nursing experience played a major role in feeding practice. This study conducted, at the Regents of the University of California San Francisco Children's Hospital (McGrath & Braescu, 2004), stated that the best judges of when to start nipple feedings were experienced nurses as they were experts at feeding small preterm infants and are valuable resources for advice on feeding problems. Keefe (2010) stated that nurses in Akron Children's Hospital in Ohio had the autonomy to decide if infants show readiness to oral feeding rather than

following a physician's order to oral feed these infants. Freed et al (1995) and Hellings and How (2004) found that prior personal breastfeeding experience was a significant influence on perceived effectiveness, and that nurses who had themselves breastfed were named as the most valuable source of information.

**Jordan vs. US.** There are no reported studies that have compared the views of HCPs in the U.S. as compared to the views of premature infant feeding in smaller, developing countries. A comparison of this type may be useful in better understanding the field of infant feeding and in informing possible intervention studies in either country.

Jordan and the United States are two different countries with different health systems, languages, cultures, and economies. Jordan is considered a small (88,780 sq. km) developing country (Gross National Income per capita=\$ 2,891) that has a homogenous population (6 million people) with Middle Eastern culture and who mainly speak one language (i.e. Arabic). Jordan, whose health institutions mainly follow the guidelines of WHO in setting up their policies, spends 9.8% of its gross domestic product on health services. The U.S., on the other hand, is a developed country (Gross National Income per capita=\$ 46,090) that is considered the fourth largest country in the world (9,147,420 sq. km), has a diverse multicultural population (319 million people) who speaks different languages besides English. In the U.S., health care institutions mainly follow the guidelines of its federal agencies such as the Center of Disease Control, and professional organizations such as the Academy of Neonatal Nursing (ANN), National Association of Neonatal Nursing (NANN), and the American Academy of Pediatrics (AAP); spends 17.9% of its gross domestic product on health services (The World Bank, 2013). Thus, a cross cultural comparison of health care professionals' views of infant feeding practices

in these two contrasting countries may yield some interesting and valuable findings that may further inform clinicians and educators.

### **Nurses vs. Doctors**

There were no recent reported studies that compared nurses' versus doctors' knowledge regarding alternative types of feeding, but there a few done on breast feeding knowledge. Molaison and Martin (2003) evaluated 99 physicians and nurses' knowledge regarding breast feeding and found that physicians had greater knowledge ( $p < 0.0001$ ) of breastfeeding ( $M = 19.7/33$ ) than nurses ( $M = 12.6/33$ ). One study conducted by Bagwell, Kendrick, Stitt, and Leeper (1993) evaluated the difference in knowledge and attitudes regarding breast feeding. Bagwell and associates (1993) surveyed 158 nurses, and 90 physicians. On a scale of 0 to 100, attitude and knowledge scores of physicians (70.2 and 75.5, respectively) were not statistically different from those of nurses (74.5 and 73.0, respectively). This lack of studies necessitate further studies to understand any differences between nurses and doctors in the field of infant feeding in order to specifically set up educational intervention that is related to the occupation, if needed.

**Effects of Experience on Knowledge, Beliefs, Preference, and Behavior Regarding Types of Feeding.** There are no previous studies that have been conducted to specifically evaluate effects of neonatal health care experience on knowledge, beliefs, preference, and behavior regarding types of feeding. However, a meta analysis done by Schmidt, Hunter, and Outerbridge (1986) found that experience in general has a substantial direct impact on job knowledge and a smaller direct impact on performance capabilities.

## **Summary: Issues Affecting Choosing Feeding Types**

A number of factors may affect the decision of HCPs and parents regarding choosing a type of feeding, such as preference, misconceptions, negative beliefs, experience, and country of residence.

Although cup feeding has some physiological and possible psychosocial benefits to offer preterm infants, a study by Collins and associates (2004) showed that mothers were not eager to embrace this method of feeding. Reasons reported by mothers for non compliance with cup feeding were (a) the advice of the nurse/midwife, (b) mothers did not like it, (c) mothers had problems with it (d) infant was not managing cup feeds, (e) infant was spilling a lot, (f) infant was not being satisfied, or (g) it was taking too long to feed.

Also, studies of breastfeeding found that HCPs had very limited knowledge and skills and lacked training and education regarding breastfeeding for both healthy and NICU infants. Studies also showed that HCPs had numerous misconceptions and negative beliefs regarding breast feeding, bottle feeding, and cup feeding. These misconceptions and beliefs included that breastfeeding is more difficult and requires more effort than bottle-feeding for preterm infants, the baby would have better intake from a bottle than from breast, infants are at higher risk of aspiration pneumonia when using cup feeding, cup feeding is awkward, and having strong feelings against cup feeding.

Country of residence is another factor that could influence HCPs choice. Differences between Jordan and US in regards to health systems, languages, cultures, economies, as well as following different guidelines set up by different organizations, could affect the choice of feeding type.

Neonatal health care experience and education of HCPs are other factors to be taken in consideration, but there are no previous reported studies that specifically evaluated the influence of these factors on feeding types.

### **Cross-Cultural Research**

This cross-cultural study compares behaviors of HCPs in two different cultures. In the following section, characteristics of the responsive cross cultural researcher and challenges in cross cultural research will be discussed in details.

In an age of increased globalization and technology, cultures are being interconnected in more ways than ever before. Within the US and in other areas of the world such as the United Kingdom, Australia, Canada, and the Far East, it is rare to find any place that is only populated by people of one culture. Rather, countries have become a melting pot of many different cultures. As such, it is important for health care professionals and researchers to carefully examine possible cross-cultural differences in knowledge, beliefs, preferences, and behaviors of clinicians in various geographical and cultural contexts. Assumptions that results found in one setting automatically apply in another is a dangerous assumption. A “one size fits all” approach to generalizing clinical beliefs and practices is not appropriate. Thus, more research in this global age must begin to examine cross-cultural differences and similarities so that we can learn from each other. It is also important to the development of specific, individualized, targeted interventions –which have the greatest likelihood of success in changing practice and improving outcomes.

**Characteristics of the responsive cross cultural researcher.** When conducting cross-cultural research, a researcher should (a) understand his/her own race and cultural beliefs, values,



and norms and know how these affect relationships with others; (b) be aware of and understand the culture of the place of work and the society; (c) use techniques and strategies to promote effective intercultural interactions by having effective communication, use of theories that deals with diverse groups, employ a diverse research team, and make research procedures compatible with group norms; and (d) focus on topics relevant to diverse groups (Clark, 2012). By doing so, researchers will go into their studies with an open mind, leading to more quality outcomes.

**Challenges in cross cultural research.** Cross-cultural research occurs in one of three contexts: (a) Comparing phenomena or behaviors across two or more cultures, (as is the case in this current study), (b) researchers and study participants are of different cultural backgrounds, and/ or (c) application of measurements developed in one cultural context to another cultural group.

Many issues within cross cultural research must be examined before one can perform a cross-cultural investigation. These include Institutionalized Review Board (IRB) training and review, cultural adaptation of interventions/ instruments, and participants recruitment (Clark, 2012). In some countries other than the U.S. (such as Jordan as in the case of this current study), researchers do not need to get approval from an IRB or taking consent from participants. Yet, they still may need approval from their institution's IRB and this differing of regulations can cause some confusion as issues of approval and consent are sorted through (Yu & Ebbs, 2011). If approval is needed in the foreign country, the proper procedures of obtaining this must be identified and completed in the country of the target population. In this study, an IRB approval was obtained from the University of Massachusetts, but there was no IRB approval needed from the organizations involved in this study.

Adaptation of interventions/ instruments for use in a cultural group other than the culture for which they were designed is another challenge. Researchers need to be able to create and use interventions/ instruments that are result in locally relevant solutions for locally identified problems, and acceptable to the target populations (Clark, 2012). Pure linguistic translation is not enough. Appropriate contextualization is an integral concern as well, as differences in the wording of questions can cause discrepancies in findings; leading to false conclusions and consequent inappropriate policy implementation (Thomas, 2007).

To resolve such a challenge, researchers must coordinate with members of the cultural group to be studied to be sure that the study interventions/ instruments are fitting with the group's culture; and to validate linguistic, functional, and cultural equivalence of the instrument. Furthermore, researchers have to be creative and have to manipulate the way to recruit people from other cultural groups; such as engaging local liaisons of that cultural group in identifying and developing appropriate data collection measures for recruiting participants (Clark, 2012).

Measurement invariance is another concern. The difference in definitions and meanings of the same concept in different cultures, or presence of different factors that affect the concept can cause measurement invariance. Statistical procedures such as multiple-group confirmatory factor analysis can be used to help resolving such an issue. Researchers should also include members of the cultural group in the interpretation of study findings, and discuss with members of the cultural group to determine what is next in response to findings (Clark, 2012).

### **Conceptual Definition of Variables**

**Country.** Country is “A nation with its own government, occupying a particular territory” [Oxford University Press (OUP), 2014].

**Occupation.** Occupation is a set of tasks and duties executed, or meant to be executed, by one person [Organisation for Economic Co-operation and Development (OECD), 2001].

**Level of education.** Education is defined as “a body of knowledge acquired while being educated” (OUP, 2013a). Highest level of education is the most degree achieved in the education ladder (OECD, 2003).

**Neonatal care experience.** The neonatal period is defined as the first month of life; however, these newborns are often sick for months. Neonatal care experience is a subspecialty of working with newborn infants born with a variety of problems ranging from prematurity, birth defects, infection, cardiac malformations, and surgical problems; and it encompasses those infants who experience problems shortly after birth, and those infants who experience long-term problems related to their prematurity or illness after birth (National Association of Neonatal Nurses, 2013).

**Knowledge.** Knowledge is defined as “facts, information, and skills acquired by a person through experience or education”, it is “the theoretical or practical understanding of a subject” (OUP, 2013b).

**Belief.** Belief is defined as “a firmly held opinion or conviction” (OUP, 2013c).

**Preference.** Preference is “a greater liking for one alternative over another or others” (OUP, 2013d).

**Past behavior.** It is the way in which a person previously acted in response to a particular situation (OUP, 2013e).

## Theoretical Framework: Knowledge-Attitudes-Behavior Model

The knowledge-attitude-behavior (KAB) model was proposed as a way of explaining the role of knowledge and behavior change (Flegal, 1996). The idea was that as knowledge formulates in a health behavior domain, changes in attitude are initiated, eventually leading to changes in behaviors (Figure2) (Baranowski, Cullen, Nicklas, Thomson & Baranowski 2003; Lin, et al., 2007).

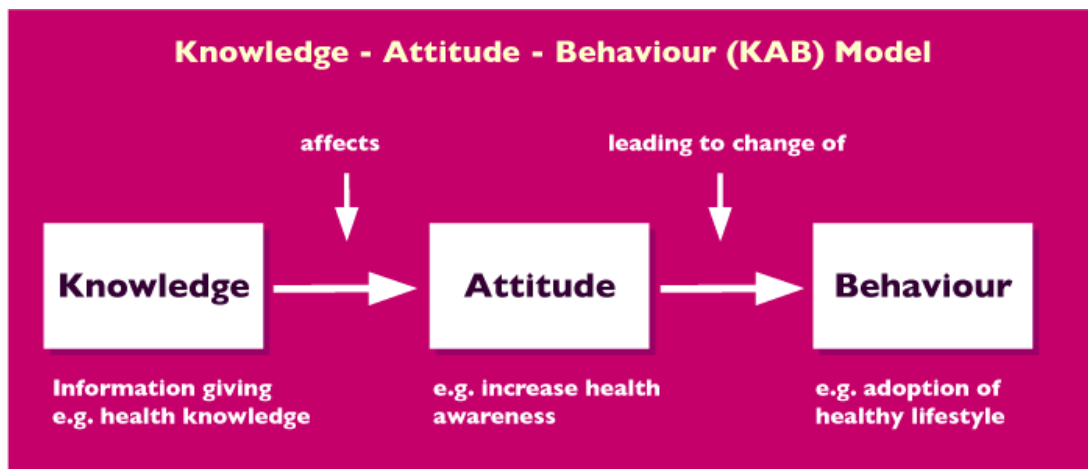


Figure 2. Knowledge-Attitude-Behavior Model

The KAB model is a modification of the Theory of Planned Behavior. The main difference is adding “knowledge” as a variable. It was added because psychologists often consider knowledge a necessary precursor to attitudes (Kaiser et al., 1999). The KAB model demonstrates that knowledge is imperative for changes in attitude which in turn will lead to health-related behavior. The KAB model has been proposed as a way of explaining the role of knowledge. The KAB model proposes that behavior changes gradually. As knowledge accumulates in a health behavior domain, changes in attitude are initiated. Over some period of time, changes in attitude accumulate, resulting in behavioral change (Baranowski et al. 2003).

Contento, Randell, and Basch (2002) stated that education is based on the paradigm that knowledge leads to attitude change, which in turn, leads to behavior change.

The change in attitude seems to be the motivational force. Attitude could be some simple set of valences, beliefs about a behavioral mechanism, or something more complex. Attitudes could influence all the decisions in the eating and physical activity events.

(Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003).

**KAB model and feeding.** There are a few studies that have demonstrated that educational interventions can improve HCPs' knowledge, skills, and attitudes; but no reported studies have connected cup feeding behavior with KAB model. Bernaix, Schmidt, Arrizola, Iovinelli, and Medina-Poelinez (2008) tested an educational intervention designed to improve lactation knowledge, attitudes, and beliefs of NICU nurses. A total of 64 NICU nurses participated in the study, and it was found that educational intervention was effective for improving NICU nurses' lactation knowledge and attitudes. Also, Merewood, Philipp, Chawla, and Cimo (2003) evaluated the impact of a Baby-Friendly designation on breastfeeding rates in NICU. They found that NICU breastfeeding initiation rate increased from 34.6% to 74.4% ( $P < .001$ ), the proportion receiving any breast milk rose from 27.9% to 65.9% (1999) ( $P < .001$ ), and the proportion receiving breast milk exclusively rose from 9.3% to 39% ( $P = .002$ ). The implementation of Baby-Friendly policies leading to a Baby-Friendly designation was associated with increased breastfeeding initiation and duration rates. The United States Breastfeeding Committee (USBFC) has developed competencies for breastfeeding and lactation that are applicable to all care providers involved in the care of women and infants. These competencies include skills such as “know how and when to use technology and equipment to support breastfeeding” and “the ability to preserve breastfeeding under adverse conditions (USBFC,

2008). Likewise, the AAP Policy Statement on breastfeeding details the expectations of pediatricians in promoting, supporting and protecting breastfeeding (AAP, 2005).

**Analytical framework.** The KAB provides the theoretical framework for this study. In this study, the knowledge of interest is the HCP's knowledge regarding preterm infant feeding types. The attitude of interest is the HCP's beliefs regarding preterm infants feeding types, and the behavior of interest is the HCP's preference and past behavior regarding cup feeding.

#### **KAB and dependent variables.**

**Knowledge.** Knowledge is always perceived as an important criterion that influences the action. One can be expected to make the right choice only when if all the necessary information is available to the individual. In the phase of knowledge, the individual is exposed to innovation's existence and gains some understanding of how it functions. (Bandura, 2001; Schneider and Cheslock, 2003, Myers, 2003, Butler and Mattern, 2001).

According to KAB, there are three types of knowledge (Kyratsis, Ahmad, & Holmes, 2012):

- a) Awareness-knowledge: awareness that an innovation exists. In this study, the questionnaire included questions regarding if the participants have ever heard about cup feeding or have ever used it.
- b) "How-to"-knowledge: consists of information necessary to use an innovation properly. In this study, the questionnaire included questions regarding the proper way of using cup feeding.
- c) Principles-knowledge: more general type of knowledge that is dealing with the

functioning principles underlying the innovation. In this study, the questionnaire included questions regarding benefits and disadvantages of feeding types.

***Belief.*** There are two levels of attitude/ belief (Dijkstra, 2012):

- a) A specific attitude toward the innovation: it is composed of a favorable or unfavorable belief in the usefulness of the new idea for the individual. In this study, section 2 of the questionnaire included items to assess HCPs positive or negative beliefs regarding feeding types.
- b) A general attitude toward change: one route to developing such a general orientation toward change lies in the proper selection of innovations for sequential introduction. In this study, a question was included in the questionnaire asking if the participants were willing to use cup feeding in the future.

Based on the two levels of attitude/ belief above, attitudes toward an innovation usually mediate between the knowledge and behavior. Before taking an action, the individual goes through persuasion phase that leads to either a favorable or an unfavorable attitude towards the innovation.

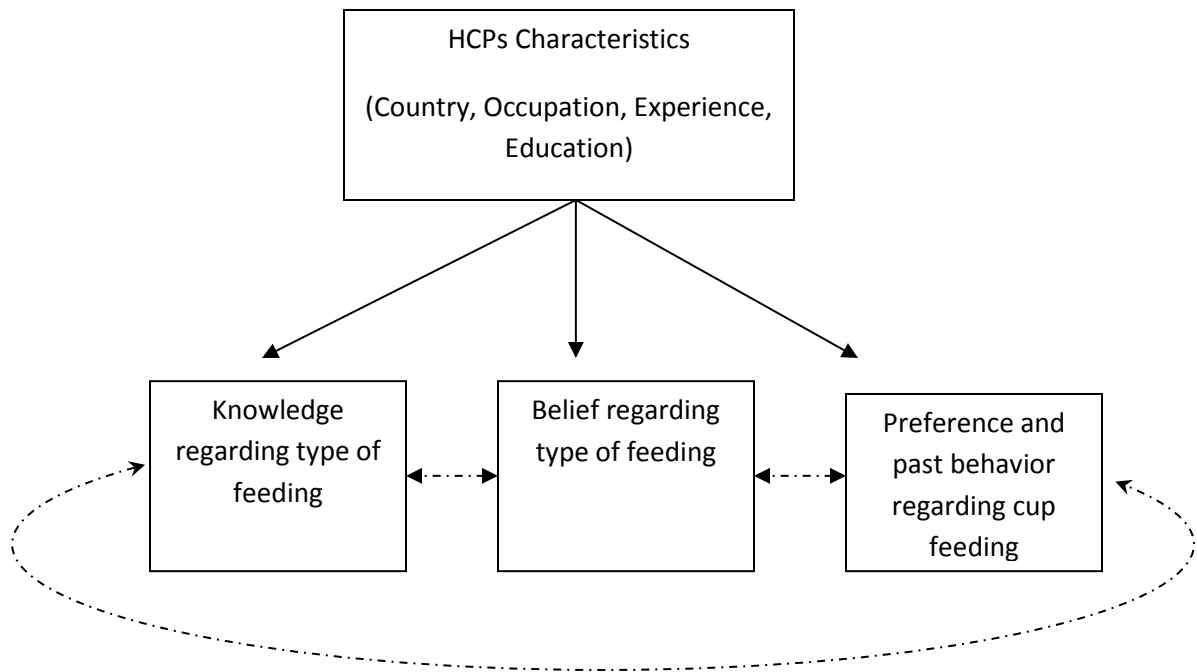
***Preference and past behavior.*** Other than knowledge and beliefs, there are two main factors that affect the behavior in the KAB model (Leiserowitz, et al., 2004):

- 1) Individual capability: This includes lack of specific skills, illiteracy, low social status, lack of resources (both time and money), lack of empowerment, and habits and routines. In this study, participants were asked about their occupation, if they had received classes and training regarding feeding types, and if they have the authority to choose feeding type for the preterm.

- 2) External constraints: These include lack of choices, material costs and rewards, laws and regulations, available technologies, social norms and expectations, and social, economic, and political contexts. In this study, participants were asked about their country, ethnicity, if their hospitals follow BFHI, if their hospitals encourage breast feeding. However, it was not possible to control individual capabilities of the respondents because of the online approach to recruit a convenient sample. Indeed, one of the individual capabilities that differed between Jordanian participants and US participants was that Jordanian participants did not have tube-pumps to use for NGT feeding. Because of these barriers, researchers are beginning to make a theoretical shift from the K-A-B model to more complex models, recognizing that multiple factors affect behavior change.

The main focus of this study was to evaluate some of the individual's capabilities and external constraints that affect knowledge, belief, and preference and past behavior. These capabilities and constraints included country, occupation, experience, and education of HCPs. The conceptual framework underlying this study is illustrated in Figure 3 below.





*Figure 3. KAB-Feeding Model*

The nature of the relationships between HCPs Characteristics (i.e. Country, Occupation, Experience & Education) and Knowledge and belief regarding type of feeding , and Preference and past behavior regarding cup feeding is depicted with solid lines. Dashed lines, on the other hand, indicate relationships that were not investigated in this study.

#### **K-A-B Model and its limitations.**

- 1) Knowing about something new is usually different from using it. Many individuals know about many things, but they have never used it. So, an increase in knowledge does not necessarily lead to an increase in behavior change (Leiserowitz, et al., 2004).
- 2) People's behavior frequently precedes changes in beliefs (Stanhope & Lancaster, 2004).
- 3) The KAB theory is based on the premise that nutrition knowledge leads to behavior change through attitude only. It put a lot of emphasis on the behavioral choices of the

individual and ignore other important factors that may constrain and influence those choices (Stanhope & Lancaster, 2004; Baranowski, et al., 2003).

**Theoretical framework summary.** The idea of knowledge-attitude-behavior (KAB) model was that as knowledge formulates and accumulates in a health behavior domain, changes in attitude are initiated. Over some period of time, changes in attitude accumulate, resulting in behavioral change. There are a few studies that have demonstrated that educational interventions can improve HCPs' knowledge, skills, and attitudes; but no reported studies have connected cup feeding behavior with KAB model. The KAB provides the theoretical framework for this study; where the knowledge of interest is the HCP's knowledge regarding preterm infant feeding types. The attitude of interest is the HCP's beliefs regarding preterm infants feeding types, and the behavior of interest is the HCP's preference and past behavior regarding cup feeding. The main focus of this study was to evaluate some of the individual's capabilities and external constraints that affect knowledge, belief, and preference and past behavior. These capabilities and constraints included country, occupation, experience, and education of HCPs.

## **CHAPTER 3**

### **METHODOLOGY**

In this chapter, the study methods will be presented and discussed. This discussion will include the research design, sample, setting, online surveys, instruments, data collection and analysis, and operational definition of variables.

#### **Research Purpose**

This study was conducted to evaluate the influence of country (Jordan vs. US), occupation (nurse vs. physician), experience, and education on NICU health care provider's (HCP): (a) knowledge, (b) beliefs, (c) preference, and (d) behavior regarding feeding of preterm stable infants.

#### **Research Design**

A non-experimental cross-cultural correlational design was used for this study. One of the advantages of using a correlational design in this study was the ability to study a wide range of variables and their relationships (Lai, 2011).

#### **Setting**

An online internet survey was used for this study to collect data from participants. The questionnaire was converted into an Internet-based format through the use of Askmonocle. Askmonocle is a newly developed free-to-use website. The site is easy to use even for non-technical people as it has several features that enable fully customizable surveys. Askmonocle has built-in templates to enhance the appearance of the survey as well as many customization

options including colors, fonts, and logo. Researchers have the option to use multiple choices or drop down menu, and they can watch live results.

### **Online Surveys**

This study employed the use of an online survey. Surveys/questionnaires are among the most frequently used methods of collecting data (Denscombe, 2003). There are different ways to administer a survey/questionnaire: (a) by hand; (b) by mail; (c) by email; or (d) electronically through an online survey website (Shih & Fan, 2008). In this study, the questionnaires were administered electronically through an online survey website that is called “Askmonocle”.

Recently, there has been a remarkable increase in computer and internet use worldwide. In 1996 in the U.S, for example, 30% of adults had computers at home and 27% logged online daily. In 2003, 61.8 % of adults had computers in their home and over 54.7 % reported accessing the internet. By 2011, 75.6 % of households reported having a computer and 71.7 percent of households reported accessing the internet (U.S. Department of Commerce, 2013). The increase in technology use has made online surveys widely acceptable to the public (Wood, Kowalczyk, Elwyn, Mitchell, & Gallacher, 2010). Therefore, using online survey research has become more popular than before, even more so than mail surveys that has been used by researchers in different disciplines for a long time (Shih & Fan, 2008).

### **Advantages of using online questionnaires.**

There were a number of advantages of using an internet survey in this study. Several advantages are discussed below.

***Manipulating the “poor control” issue.*** Researchers who use online questionnaires have the advantage of manipulating the “poor control” issue associated with hard copies, such as

preventing incomplete responses or incomplete questionnaires (Jones et al, 2008). In this study, no participant was able to log into the questionnaire without reading the consent form and click on the “I AGREE” tab. Due to IRB constraints, subjects were allowed to skip questions.

***Decreasing the chance of errors.*** When using an online survey, errors resulting from data entry are prevented as the data are automatically entered once the questionnaire is filled out. Participants are not likely to enter erroneous or unacceptable data such as entering a word when a number is requested or entering multiple responses (Dannetun et al, 2007, Rhodes, Bowie, & Hergenrather, 2003).

***Speeding up the overall research process.*** The process of gaining results is facilitated because data can be copied or exported directly into analysis software (e.g., SPSS). Indeed, in some websites, data analysis tools are part of the services provided. Not needing to enter and process data, speeds up the overall research process and reduces research assistant costs (Guise, Chambers, Valimaki, & Makkonnen, 2010). In this study, participants’ entered data was downloaded and exported into Microsoft Excel and later imported into SPSS version 22.0.

***Ease of access to participants.*** In comparison to paper and pencil surveys, reaching participants, especially in cross cultural research, is easier and faster when using an online survey (Temple & Brown, 2011). Participants can access the questionnaire online, respond, and submit responses at a time that is convenient for them without having to have a testing site, appointments, or expensive, time consuming mailing (Rhodes et al., 2003). This is important especially for those who are geographically far from the researchers. Using an internet survey not only increase the possibility of a larger sample, but also improve the likelihood of having a diverse sample (Temple & Brown, 2011).

***Easy and inexpensive to implement for researchers.*** As mentioned, online surveys are more cost effective as they do not require the use of paper or photo copying, and there is no need for data collection and entry staff. This may save between 20% to 80% of total data collection costs (Rhodes et al., 2003). In this survey, Askmonocle survey website was free to use.

***Disadvantages of using online questionnaires.*** Some disadvantages of the chosen method of data collection, an online survey include: threats to the external validity and study reliability, technical problems, missing data, incomplete or duplicate data, sample representativeness, response rates, and ethical issues (Whitehead 2007).

***Threats to the external validity and reliability.*** In an online survey, the researcher loses control of the length of exposure, quality of the exposure, location of exposure (e.g. work, home, and library), number of exposures, identity of participants, and time of exposure. Such variables can have an impact on the reliability of responses (Whitehead, 2007). In this study, it was not possible to determine if participants were checking the accuracy of their answers before submitting them.

Although not an issue in the current study, there may be differences between online and offline versions of the same test in terms of score distribution and psychometric properties (Buchanan et al., 2005). Furthermore, people may not complete the questionnaire online in the same way as they do face to face due to the layout of items on the web page.

Moreover, the linguistic competence of the respondent, especially if the survey is distributed internationally cannot be guaranteed (Whitehead, 2007). A potential solution to this is to include participants from the target country in an assessment of questionnaire face and content validity prior to conducting the study. In this study, the questionnaire was given to four participants from Jordan who had bachelor degrees, two of them were HCPs and two were non-

HCPs. These participants were asked to determine if items were clear, readable, and understandable. In addition, the questionnaire was given to three academic reviewers from the University of Jordan to review.

***Sample bias.*** Online surveys often target specific populations who have internet access, such as staffs or students at a university and company employees (Shih & Fan, 2008). This in turn does not ensure that all members of the population are available to participate, thus increased potential biases (Rhodes et al., 2003). Dannetun et al, (2007) found that high level of education clearly influenced the tendency to answer by the internet. Zuidgeest et al (2011) also found that respondents who filled out online questionnaires were significantly younger and more educated than those who filled out paper questionnaires. In this study, using an online questionnaire might have caused sample bias.

***Technical problems.*** Different screen formats, inconsistent computer administration, and technical or interface problems (e.g., server being offline or non-functioning home internet) can elicit differential online survey response rate (Deutskens, de Ruyter, & Wetzels, 2005).

***Ethical issues.*** One of the challenges that ethics committees and institutional review boards focus on is what constitutes informed consent (Rhodes et al., 2003). In online surveys, it is important to have an introductory page that describes the study, explains what participation will consist of, and outlines the risks and benefits of participating. A consent form can be provided to participants before starting data collection. One way of gaining consent is by designing a button at the bottom of the information page that says, "I agree to participate in the study". Although researchers cannot know if participants really understand the research purpose and the questions, which is also true of paper and pencil surveys, this can be partially addressed by asking participants to email the researcher if they have any questions (Rhodes, et al., 2003).

In this study, a consent form was introduced before logging into the questionnaire, and the PI left contact information. This consent form included a statement of “By clicking ‘I AGREE’, you are indicating that you are at least 18 years old, have read and understood this consent form, and agree to participate in this research study”.

***Anonymity and privacy violation.*** Every time we log into the internet, there is a slight chance that a computer “hacker” may be able to determine a respondent’s IP address and the site visited, thus violating a potential participant’s privacy. Researchers must include this information in the consent form.

However, all potential confidentiality controls should be used and these methods need to be shared with potential participants. As a part of this process, researchers will not identify participants by email, or via participants’ IP address of website login (Whitehead, 2007). Jones et al, (2008) found that this assurance is an essential factor that affects the quality and level of participants return, even in a highly structured environment with full control over the technology (i.e. computer lab).

Security of data collected is another imperative factor to take in consideration. Researchers have to explain to participants that all data will be stored securely in a folder that is locked by a password. Only members of the research team will have access to it, and email addresses will not be used to track individuals nor they will be traceable to individual participants’ answers.

In this study, the following paragraph was included in the consent form:

“We believe there are no known risks associated with this research study, however, as with any online-related activity, the risk of security breach is always possible. To the best of our ability, your answers in this study will remain confidential, no identifying information will be



retained by the PI. In addition, there will be limited access to the data and the data will not used for purposes other than those described in this consent form.”

## **Sample**

**Recruitment.** There are different online recruitment strategies that have been used in many internet-based studies to attract participants to the studies. For example; direct emails to personal contacts, email snowballing, newsletters, emails to organization members or student populations internet research panel emailing lists, internet advertisements, postings on online forums and discussion boards, website announcements, and social media tools such as Facebook (Temple & Brown, 2011).

In this study, multiple internet-based recruitment strategies were used to recruit participants, and included Email recruitment, website recruitment, and snowballing. This multiple approach strategy decreased selection bias and external validity issues (Temple & Brown, 2011; Miller & Sonderlund’s, 2010).

Recruitment began after IRB approval from the University of Massachusetts, Amherst. Data were collected over a five-month period; from May 2014 to September 2014. Data collection lasted until no further responses were received, with a total eligible sample size of 178 participants.

Recruitment mainly targeted nurses and physicians from the U.S. and Jordan. However, a few participants from different countries responded as a result of the above mentioned internet-based strategies. Jordan, which is the home country of the principal investigator (PI), was chosen as it represented an accessible source of participants in the Middle East, where participants might

have different cultural background and beliefs than those in the USA. In addition, Jordan as a third world country has health care facilities that follow the guidelines of the WHO compared to the USA health care facilities that follow the guidelines of its national organizations like the Academy of Neonatal Nursing (ANN), National Association of Neonatal Nursing (NANN), and the American Academy of Pediatrics (AAP). Nurses and physicians were chosen among other health care team members who participate in the process of feeding preterm infants because nurses and physicians are the major authority in deciding which method to use for infant feeding, and mothers are influenced by their advice.

Three strategies were used to recruit participants: Email recruitment, website recruitment, and snowballing. Recruitment messages included five types of messages. The first one consisted of a straight call for participation that included information regarding the study and the website link that contained the questionnaire. The second, third, and fourth ones were a brief reminder which was sent to increase response rate. Guise et al (2010) found that reminders played a major role in increasing response rates from 6% to 44% and 66% after the first and second formal reminders, respectively. The fifth message was a Thank You message. These messages were sent in three weeks intervals. All of the messages asked recipients to forward the e-mail to eligible people they knew.

***Jordan recruiting.*** For the email recruitment, information about the study and the link to the questionnaire was sent to the Jordanian Nurses and Midwifery Council (JNMC), and they were asked to forward the information and the link to the nurses in their e-mail list.

In website recruitment, three websites were contacted: JNMC and two Arab medical neonatal related websites [i.e. Arab Neonatology Forum (ANF)]

<http://www.arabneonate.org/about.asp>, and Arab Neonatal Group (ANG) <https://www.facebook.com/ArabNeonatalGroup>]. The AFN and the ANG websites were identified through Google searches. Key words such as Jordanian Arab neonatologist association were used. The administrators of these three websites were asked to post recruitment messages and the questionnaire link on their websites.

For snowballing, the nurses who are in the email list of the JNMC and neonatologists at ANF and ANG were asked to forward the information and the questionnaire to their coworkers and colleagues. In addition, emails were sent to ex-coworkers and ex-colleagues of the PI, and they were asked to send them to the neonatal nurses and physicians at NICU whom they know.

**USA recruiting.** Email recruitment consisted of sending information about the study and the questionnaire link to the administrators of two medical and nursing neonatal related websites; Internet Community for Professionals in Neonatal Medicine (ICPNM) (<http://www.99nicu.org>), and [nicu-net@yahoogroups.com](mailto:nicu-net@yahoogroups.com). A request was made to the administrator to forward the information and the link to the sites' email lists. These two medical and nursing neonatal related website were identified through Google searches. Key words such as neonatologist association and neonatal nurse were used.

For the website recruitment strategy, the administrators of the Internet Community for Professionals in Neonatal Medicine website were asked to post recruitment messages on the website home pages. In addition, recruitment messages were posted on the discussion board of National Association of Neonatal Nurses (NANN) website ([www.nann.org](http://www.nann.org)). The discussion board automatically sends emails to members of NANN with the contents of the discussion board daily.

For snowballing, participants were asked to forward the information and the questionnaire to their coworkers and colleagues. In addition, emails were sent to coworkers and colleagues of the PI, and they were asked to send them to the neonatal nurses and physicians whom they know who work in a NICU.

**Inclusion criteria.** Registered Nurses, Neonatal nurse practitioners, attending neonatologists, attending pediatricians, neonatal Fellows, pediatric fellows, and residents who were working or had directly worked with premature infants in a NICU were eligible for this study.

**Sample size.** Adequate sample size is important for the strength of the study and the ability for generalizing its results. Choosing a specific sample size is influenced by different factors: the purpose of the study, population size, the risk of selecting a "bad" sample, the sampling error (level of precision), the confidence level, and the degree of variability (Israel, 2013).

Using G\*Power 3.1.7, a power analysis indicated a minimum of 128 subjects were required to get a medium effect size of 0.25, an alpha error 0.05, a power of 0.8, for 2 groups (Jordan, USA). The following options were used in the G\*Power software: "F-test," "ANOVA: Fixed effects, omnibus, one-way," and "A priori."

This study used a convenience sample with a total of 178 participants: 87 (48.6 %) participants from Jordan, 73 (40.8%) participants from USA, and 19 (10.6%) from different countries (four from UK, one from Sweden, one from Nigeria, one from India, one from

Portugal, one from Canada, one from Italy, one from Turkey, one from Pakistan, and seven from other non-mentioned countries).

## **Instrument**

An investigator-developed questionnaire was formulated based on information found in literature to evaluate the aims and hypotheses for this study (See appendix A). There were no existing tools available for use. The instrument was developed in English. Parallel surveys were sent to both cohorts (American and Jordanian HCPs). There was no need to translate the questionnaire into Arabic, the official language in Jordan, because English is the second language and it is used as a professional language in nursing and medical colleges where textbooks, lectures, and exams are in English. These factors lend credence to the acceptance of cultural equivalency. Face validity and content validity assessment confirmed the lack of the need for translation (See face and content validity below). The initial version of the questionnaire was validated in paper-and-pencil format (See face and content validity below). The final version was converted into an Internet-based format through the use of Askmonocle.

There was a cover letter as a front page (see Appendix B). The cover letter explained the study and included a study title, a description of the purpose of the study including procedures, risks and benefits, compensation, confidentiality, voluntary nature of the study, and researcher contact information. The front page included a consent statement saying: “By clicking ‘NEXT’ (AT THE RIGHT LOWER BOTTOM OF THE PAGE) you are indicating that you are at least 18 years old, have read and understood this consent form and agree to participate in this research study.” Participants could not begin the questionnaire until they clicked the “I AGREE” button (see Appendix B).

**Validity of the Instrument.** Validity is the degree to which an instrument is able to assess the specific concept that the researcher is attempting to measure. In other words, does the instrument measures what it is supposed to measure?

**Face validity.** Face validity is concerned with how a measure or procedure appears. To test the face validity of the questionnaire, the questionnaire was given to eight participants who had bachelor degrees. Four of these eight were from Jordan and four from USA; two of each four were HCPs and two were non HCPs. These participants were asked to determine if the questionnaire seemed well designed, if it generally appeared to measure what was intended to measure, and if items were clear, readable, and understandable (Howel et al, 2013). Comments were taken in consideration when the questionnaire was re-developed.

**Content validity.** Content validity concerns are related to an evaluation if the items in the questionnaire represent the maximum range of possible items the questionnaire should cover (Howel et al, 2013). To test content validity, the questionnaire was given to four faculty members from the College of Nursing at Wayne State University in Michigan, three academic reviewers from the University of Jordan, and a neonatologist from the Children's Hospital of Michigan. All comments and edits were taken in consideration to re-develop the questionnaire. Reviewers determined that the final version of the questionnaire had content validity.

**Reliability of the instrument.** The reliability (internal consistency) of the belief scales for feeding types (i.e. Breast feeding, bottle feeding, NGT feeding, and cup feeding scales), as well as cup feeding preference and past behavior scale, was evaluated. Identifying internal consistency reliability for knowledge scales and rank scales was not appropriate as there was no *a priori* hypothesis that these were scales of a similar domain.

Internal consistency of the five scales was measured using Cronbach's alpha. Cronbach alpha for beliefs about feeding scale for each of the scales is as follows: 1) 5-item breast feeding  $\alpha = 0.73$ , 2) 4-item bottle feeding  $\alpha = 0.72$ , 3) 5-item NGT feeding  $\alpha = 0.71$ , and 4) 5-item cup feeding  $\alpha = 0.71$ . Finally, Cronbach's alpha for the 8-item cup feeding use scale was 0.76. Using 0.70 as an acceptable level of  $\alpha$  (Nunnally & Bernstein, 1994) all scales were considered to have acceptable internal consistency.

### **Data Collection and Analysis**

Data were collected and entered directly by participants into Askmonocle. The full data Excel sheet was downloaded from the questionnaire website. Excel data was imported into SPSS, version 22.0. Analysis included investigation of the relationships between study predictors (country, occupation, neonatal health care experience, and education) and outcomes (knowledge, belief, and preference and past behavior). Initially, descriptive analyses were performed on all variables. Following this, t-test analyses were run to compare the means of the continuous outcome variables between dichotomous predictor variables. Crosstabs analyses were run to compare the means of the dichotomous outcome variables and dichotomous predictor variables. Multiple regression analysis was used to evaluate the simultaneous influence of all predictors on outcome variables.

### **Operational Definition of Variables**

The questionnaire is composed of five sections and evaluates five domains: demographics, feeding beliefs, knowledge, and preferences, and cup feeding prior behavior. The study evaluated four independent (predictor) variables: country, occupation, level of education, and neonatal care experience. The study evaluated three dependent (outcome) variables:

knowledge regarding preterm infant feeding, beliefs regarding preterm infant feeding, preferences regarding preterm infant feeding, and cup feeding prior behavior.

**Predictors.** The predictors evaluated were country, occupation, neonatal experience, and degree.

***Predictor 1: Country.*** Did the participant live in the US, Jordan or another country?

***Predictor 2: Occupation.*** What was the occupation of the participant: staff nurse, charge nurse, nurse manager, neonatal nurse practitioner, resident, pediatric fellow, neonatal fellow, attending neonatologist, or attending pediatrician.

***Predictor 3: Neonatal experience.*** Subjects were asked to write the number of years of experience they had working in a NICU. For analyses, neonatal experience was dichotomized into  $< 10$  years and  $\geq 10$  years. This was done for two reasons. First, to be consistent with the other dichotomous predictors and second, this would allow an examination of interaction effects among predictors.

***Predictor 4: Highest level of education.*** Subjects were asked to indicate the highest degree earned by participants: AD, BSN, MSN, DNP, DO, MD, or PhD. This variable was dichotomized into BSN or less versus advanced degree (MS or Doctoral) due to some small cell sizes.

**Outcomes.** The outcomes that were evaluated were knowledge, beliefs, and preference for breast feeding, bottle feeding, NGT feeding, and cup feeding, as well as an overall cup feeding score.



***Knowledge.*** This outcome evaluated participant self-report about their knowledge regarding breast, bottle, NGT, and cup feeding. This includes questions about safety, effects on nursing workload, baby aspiration, baby fatigue, transition to full breast feeding, infant respiration, and time. Participants responded to each item using a 7 point (0-6) scale: 0 = Never, 1 = Rarely, 2 = Some of the time, 3 = Often, 4 = Most of the time, 5 = Almost always, and 6 = Always.

***Beliefs.*** This outcome evaluated participant opinion regarding breast, bottle, NGT, and cup feeding. Questions included feeding suitability, need for frequent monitoring, awkwardness, feelings, comfort using, and comfort teaching. Participants responded to each item using a 7 point (1-6) scale: 1 = Strongly disagree, 2 = Disagree, 3 = Slightly disagree, 4 = Slightly agree, 5 = Agree, and 6 = Strongly agree.

***Feeding type preference/benefit rank.*** In this domain, participants ranked each feeding type in regard to the following: advancement to breastfeeding, heart rate, infant fatigue, infant breathing load, infant oxygen saturation, infant energy expenditure, infant weight gain, feeding time, nurse work load, aspiration, parental attachment, and parent feeding participation. For each item a rank was given to each feeding type from 1 - 4 (1 was the least preferred or had the least benefit; 4 was the most preferred or had the most benefit).

***Cup feeding preference and past behavior.*** In this domain, participant experience with and past behavior with cup feeding was evaluated using the following items: prior success cup feeding, parent success cup feeding, frequency of cup feeding, frequency of cup feeding teaching, ever heard about cup feeding (yes/no), ever used cup feeding (yes/no), do parents prefer cup feeding (yes/no), and would they consider cup feeding in the future (yes/no).

Cup feeding frequency and frequency of cup feeding teaching was measured on a 1 – 9 scale (1 = Never to 9 = Daily). Parent and participant cup feeding success was measured using a 1 – 5 scale (1 = not successful to 5 = extremely successful). In the overall cup feeding score, these four variables were dichotomized. Cup feeding frequency and teaching frequency was given a score of 1 if the participant completed each at least once every other month. Each success variable was considered a 1 if the participant rated the item from successful to extremely successful. Once the four ordinal/interval levels scales were converted to dichotomous scores, they were added to the other dichotomous scores mentioned above into a total overall cup-feeding score. The following items are included in this variable: Ever heard about cup (yes/no), ever used cup (yes/no), frequency using cup (dichotomous recoded score), participant success using cup (dichotomous recoded score), parent success cup feeding (dichotomous recoded score), frequency teaching cup (dichotomous recoded score), parent cup feeding preference (yes/no), and would they consider cup feeding (yes/no).

## CHAPTER 4

### RESULTS

This chapter describes the study results. Results include analysis of the relationship between study predictors (country, occupation, neonatal health care experience, and education) and outcomes (knowledge, belief, and preference and past behavior). Univariate analyses are presented for demographic characteristics, predictors, and outcome variables first; followed by multivariate analyses.

#### Study Sample

As discussed in the methods section, the questionnaire was active for 5 months online. During this time, 178 eligible participants submitted the questionnaire online. Below is a description of the study sample by country, ethnicity, gender, and age. The remaining predictor variables (occupation, neonatal health care experience, and education) are discussed below followed by a presentation of the outcome variables. Table 1 provides an overview of the demographic sample information. Each variable, including age, is discussed in detail below.

Table 1. Sample Demographic Characteristics.		
Variable	N	%
<b>Country</b>		
Jordan	85	49.4
US	70	40.7
Other	17	9.9
<b>Gender</b>		
Male	18	10.8
Female	148	89.2
<b>Ethnicity</b>		
Asian/Asian American	7	4.0
African/African American	5	2.9
Hispanic/Latino	3	1.7
White (Non-Hispanic)	72	41.4
Arabic/Middle Eastern	87	50.0

**Country and Ethnicity.** Among the respondents, 49.4% were from Jordan, 40.7% were from US, and 9.9% reported from other countries. As expected, the relation between country and ethnicity was significant ( $\chi^2 = 193.62$ ,  $p < .001$ ). All participants from Jordan were Middle Eastern/Arabic. Only one other participant (other country) identified as Middle Eastern/Arabic. The majority (87.1%) of the US sample was white. Among the remaining US participants, 5.7% were African American, 4.3% were Hispanic, and 2.9% were Asian. More than ½ of the “other” country participants were White (58.8%). Of the remaining seven participants, five were Asian.

Table 2. Country by Ethnicity Frequency Counts.

Country	Ethnicity					Total
	Asian American	African American	Hispanic/Latino	White/Non-Hispanic	Arabic/Middle Eastern	
Jordan	0	0	0	0	83	83
US	2	4	3	61	0	70
Other	5	1	0	10	1	17
Total	7	5	3	71	84	170

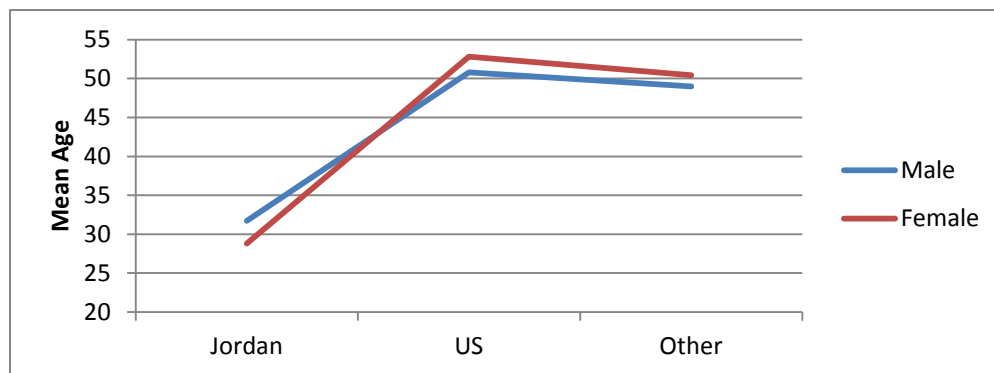
**Gender.** The majority of the sample was female (89.2%). Although gender was evenly dispersed across country for males (Jordan and US = 35%, Other = 29.4%), only 7.6% of the women were from a country other than the US or Jordan. The relation between gender and country was significant ( $\chi^2 = 8.19$ ,  $p = 0.017$ ).

Table 3. Country by gender frequency counts.

Country	Gender		Total
	Male	Female	
Jordan	6	72	78
US	6	62	68
Other	5	11	16
Total	17	145	162

**Age.** Mean of the sample was 42.3 (SD = 13.8, min = 23, max = 69). An evaluation of differences in sample age by country and gender found an overall significant main effect of country ( $F = 31.9$ ,  $p < .001$ ), but a non-significant main effect of gender. ( $F = 0.00$ ,  $p = 0.951$ ).

Post Hoc analysis found no age difference among participants from the US and Other countries ( $p = 0.481$ ), but found Jordan participants were younger than participants from both the US ( $p < .001$ ) and other countries ( $p < .001$ ). This relationship was virtually identical for men and women and there was no country by gender interaction ( $F = 0.40$ ,  $p = .670$ ).



*Figure 4. Mean participant age by country and gender.*

## Predictor Variables

Presented below are the descriptive statistics for the predictor variables occupation, neonatal experience, and education. Country descriptive statistics were presented above.

**Health Care Experience.** Across all countries, the average number of years in neonatal health care experience was 13.7 ( $SD = 12.3$ ,  $min = 0.1$ ,  $max = 47.0$ ). Just under 10% of the sample (7.6%) had less than one year of neonatal health care experience and almost half had at least 10 years of neonatal health care experience (47.7%). On average, study participants had an additional 3.5 years of non-neonatal health care experience which was significantly different ( $t = 9.4$ ,  $p < .001$ ). Although participants had more overall health care experience than neonatal experience, the two variables were highly related ( $r = 0.93$ ,  $p < .001$ ). As only one health care

experience variable could be included in multivariate analyses to avoid multicollinearity, neonatal health care experience was chosen for inclusion in analyses.

**Degree and Occupation.** As can be seen in Table 4, the sample is fairly split between AD/BSN (55.1%) versus advance degree (44.9%). Since some of the specific degree types have small sample sizes (e.g., AD, PhD, and DNP), bivariate and multivariate analyses below are performed using the two-group degree variable ( $\leq$  BSN vs. advanced).

Table 4. Predictor Variable Descriptive Statistics.		
Variable	N	Valid %
<b>Highest Degree (N=176)</b>		
AD	5	2.8
BSN	92	52.3
MS/MSN	36	20.5
DNP	10	5.7
MD	31	17.6
PhD	2	1.1
<b>Occupation (N=174)</b>		
<i>Nurse</i>	<b>142</b>	<b>81.6</b>
Staff	79	45.4
Charge	20	11.5
Clinical Manager	18	10.3
Lactation Specialist	4	2.3
NNP	21	12.1
<i>Physician</i>	<b>32</b>	<b>18.3</b>
Resident	7	4.0
Neonatal Fellow	2	1.1
Neonatologist	22	12.6
Pediatrician	1	0.6

Also presented in Table 4 is participant occupation. The majority of the sample participants were nurses (81.6%). Similar to degree, for both nurse and physical occupations, there are small cell sizes, thus, a two-group nurse by physician variable was created and used in subsequent analyses. It is important to note that all physicians had an advanced degree, but only 31.7% of the nurses had an advanced degree. This relation was significantly different (Fisher's

Exact  $p < .001$ ; used due to null cells).

## Outcome Variables

As described in the methods section, the following outcome variables were created for breastfeeding, bottle feeding, NGT feeding, and cup feeding: 1) an overall knowledge score, 2) an overall beliefs score, and 3) an overall feeding rank score. In addition, nine cup-feeding specific variables were analyzed: 1) yes/no ever heard about cup feeding, 2) yes/no ever cup fed, 3) cup-feeding frequency, 4) cup-feeding use success score, 5) cup-feeding teaching frequency, 6) parent cup-feeding success score, 7) yes/no report of parent preference, 8) yes/no would they consider cup feeding, and 9) overall cup-feeding use/success score (constructed from variables 1-8). Each of these variables is described below.

**Feeding Knowledge Scores.** Analyses comparing knowledge about breastfeeding, bottle feeding, NGT feeding, and cup feeding for the sample revealed less knowledge of cup feeding than any other feeding type. Cup feeding knowledge was significantly lower than breast feeding and NGT feeding but not significantly lower than bottle feeding. Similarly, bottle feeding knowledge was significantly less than breast feeding and NGT knowledge for the sample overall. Bottle feeding knowledge was not significantly different than cup-feeding knowledge and breast feeding knowledge was not significantly different than NGT feeding knowledge (See Table 5).

Table 5. Comparison of Feeding Knowledge Scores.

Knowledge Score	Mean	N	SD	Paired Sample t-tests			
				1	2	3	4
1 Breast feeding	2.24	177	0.82	NA			
2 Bottle feeding	2.74	177	0.75	-7.05***	NA		
3 NGT Feeding	2.24	177	0.93	0.00	7.19***	NA	
4 Cup Feeding	2.89	177	0.99	-7.3***	-1.6	-7.08***	NA

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

Note: lower scores indicated more knowledge.

**Beliefs about Feeding Scores.** Overall study participants' beliefs about feeding were most positive for breastfeeding. Beliefs about breastfeeding were significantly better than reported beliefs regarding bottle feeding, NGT feeding, and cup feeding. Beliefs regarding bottle feeding were also significantly more positive than they were for cup feeding but were not significantly different than NGT feeding. Beliefs regarding cup feeding were the least positive in comparison to all other feeding types (see Table 6).

Table 6. Comparison of Beliefs about Feeding Scores.

Belief Score	Mean	N	SD	Paired Sample t-tests			
				1	2	3	4
1 Breast feeding	4.79	177	1.03	NA			
2 Bottle feeding	4.41	177	1.04	6.61***	NA		
3 NGT Feeding	4.47	177	1.00	5.83***	-0.93	NA	
4 Cup Feeding	3.55	177	1.08	11.52***	7.42***	8.60***	NA

\*p<.05. \*\*p<.01. \*\*\*p<.001.

Note: higher scores indicated more positive beliefs.

**Overall Feeding Preference/ Benefit Rank Scores.** Overall participants reported equal scores for breast feeding and bottle feeding preference/ benefit rank. Both breast and bottle-feeding preference/ benefit rank scores were significantly higher than both NGT and cup feeding preference/ benefit rank scores. Although cup feeding preference/ benefit rank scores were lower than NGT preference/ benefit rank scores, this difference was not significant (See Table 7).

Table 7. Comparison of Feeding Preference/ benefit Rank Scores.

Rank Score	Mean	N	SD	Paired Sample t-tests			
				1	2	3	4
1 Breast feeding	2.87	174	0.31	NA			
2 Bottle feeding	2.87	175	0.32	0.07	NA		
3 NGT Feeding	2.72	175	0.30	4.50***	4.02***	NA	
4 Cup Feeding	2.69	175	0.32	4.82***	4.55***	-0.56	NA

\*p<.05. \*\*p<.01. \*\*\*p<.001.

Note: higher scores indicated higher rank.



**Outcome variables specific to Cup Feeding.** As mentioned, the following additional cup-feeding specific variables were examined: 1) yes/no ever heard about cup feeding, 2) yes/no ever cup fed, 3) cup-feeding frequency, 4) cup-feeding use success score, 5) cup-feeding teaching frequency, 6) parent cup-feeding success score, 7) yes/no report of parent preference, 8) yes/no would they consider cup feeding, and 9) overall cup-feeding use/success score. Overall sample descriptive statistics are presented in Table 8.

The majority, but not all participants (79.8%) had heard about cup feeding, but only ~ 1/3<sup>rd</sup> (38.5%) had ever use cup feeding. More than ½ of the sample reported positive parent preference for cup feeding (61%), but only 50.3% indicated that they would consider using it as a method of feeding. Both cup feeding use frequency and parent teaching frequency means (4.0 and 3.6 respectively) reflected performance of once every two months. Success scores were rated on a 5-point scale from not successful (1) to extremely successful (5). Among those who had cup-fed in the past, overall success scores for both themselves and parents were on average successful (self-mean = 2.93; parent mean = 2.65). Although both success means reflect success, participants did view themselves more successful than parents ( $t = 2.83, p = .007$ ).

Table 8. Cup feeding descriptive statistics.

Variable	N	Mean/%	SD	Min	Max
Heard about cup feeding (% yes)	173	79.8%	--	--	--
Ever cup feed (% yes)	143	38.5%	--	--	--
Cup feeding frequency	60	4.0	2.8	1	9
Cup feeding success	58	2.9	1.3	1	5
Frequency of teaching	59	3.6	3.0	1	9
Parent cup feeding success	61	2.7	1.3	1	5
Parent cup feeding preference (% yes)	172	61.0%	--	--	--
Consider cup feeding (% yes)	175	50.3%	--	--	--
Overall cup feeding score	176	2.7	2.1	0	8

## Study Aims and Hypotheses

The following section describes the study's specific aims and hypotheses. Each individual study aim is described below as well as the results pertaining the all hypotheses for that aim.

### Aims and Hypotheses

**Aim 1.** To identify if there are differences between US neonatal HCPs and Jordanian neonatal HCPs in regards to a) knowledge, beliefs, and preference/benefits rank regarding preterm infant feeding types, and b) past behavior regarding using cup feeding.

H1a: There is no difference between US neonatal HCP and Jordanian neonatal HCP in regards to knowledge regarding preterm infant feeding types.

H1b: There is no difference between US neonatal HCP and Jordanian neonatal HCP in regards to beliefs regarding preterm infant feeding types.

H1c: There is no difference between US neonatal HCP and Jordanian neonatal HCP in regards to preference/benefits rank of preterm infant feeding types.

H1d: There is no difference between US neonatal HCP and Jordanian neonatal HCP in regards to past behavior regarding using cup feeding.

To evaluate hypotheses H1a, H1b, H1c, and H1d, t-tests using a 2-group country variable (US vs. Jordan) were performed on all interval level measurements. In addition, for H1a and H1b, a MANOVA was performed to evaluate the effect of country across all feeding types. For these analyses, a table describing sample means and t-test statistics as well as graphical representation is provided. All dichotomous variables were assessed using  $\chi^2$  analysis. For all analyses, comparisons across all feeding types are performed first followed by analysis of all

non-cup feeding specific measures. Although there were participants from other countries that provided data, the sample size is too small to allow for such comparisons. Further data would be needed to include this data in multivariate analyses.

**H1a.** Analyses evaluating the relation between country and health care provider knowledge in infant feeding revealed differences by country for all feeding types. Overall, the US sample had significantly more knowledge about all feeding types (breast, bottle, NGT, and cup). MANOVA results identified an overall effect of country (Wilks' Lambda  $F = 17.29$ ,  $p < .001$ ). US participants reported the most knowledge about NGT feeding and the least knowledge about cup feeding. Jordan participants reported knowing most about breast feeding but also reported the least knowledge about cup feeding (Table 9).

Knowledge Scores	Country	N	Mean	SD	t
Breast Feeding	Jordan	84	2.58	.86	5.19***
	US	70	1.93	.63	
Bottle Feeding	Jordan	84	2.91	.73	3.06**
	US	70	2.55	.74	
NGT Feeding	Jordan	84	2.70	.95	7.32***
	US	70	1.70	.69	
Cup Feeding	Jordan	84	3.25	.80	4.04***
	US	70	2.63	1.10	

†  $p \leq .10$ . \*  $p \leq .05$ . \*\*  $p \leq .01$ . \*\*\*  $p \leq .001$ .

Note: lower scores indicated more knowledge.

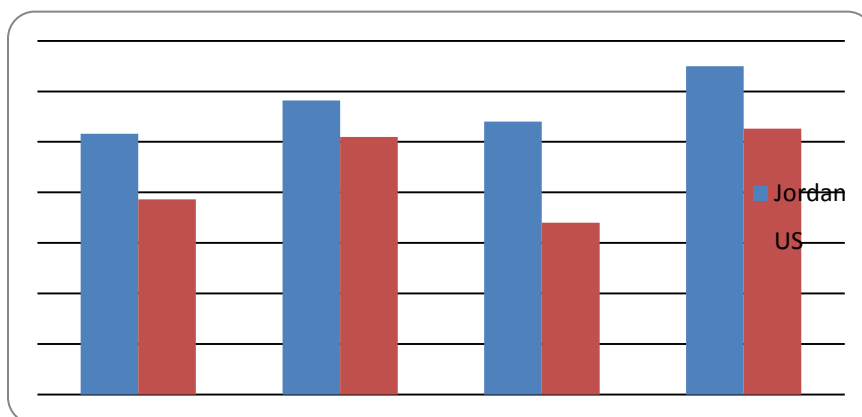


Figure 5. Mean participant knowledge scores by country.

**H1b.** With the exception of cup feeding, analyses evaluating the relation between country and health care provider beliefs regarding infant feeding revealed differences by country for all feeding types (Table 10). Significant differences were seen for breast, bottle, and NGT feeding by country. For all significant differences, the US participants viewed breast feeding, bottle feeding, and NGT feeding more positively than Jordanian participants. Although participants from the US also viewed cup feeding more favorably than Jordanian participants, this difference was not significantly different. Both US and Jordanian participants viewed breastfeeding most favorably and cup feeding least favorably. There was a significant overall effect of country across feeding types (Wilks' Lambda  $F = 79.02$ ,  $p < .001$ ).

Beliefs Scores	Country	N	Mean	SD	t
Breast Feeding	Jordan	84	4.03	.81	-15.11***
	US	70	5.61	.47	
Bottle Feeding	Jordan	84	3.74	.82	-11.99***
	US	70	5.20	.67	
NGT Feeding	Jordan	84	3.70	.76	-11.73***
	US	70	5.28	.53	
Cup Feeding	Jordan	84	3.35	.69	-1.59
	US	70	3.61	1.33	

†  $p \leq .10$ . \*  $p \leq .05$ . \*\*  $p \leq .01$ . \*\*\*  $p \leq .001$ .

Note: higher scores indicated more positive beliefs.

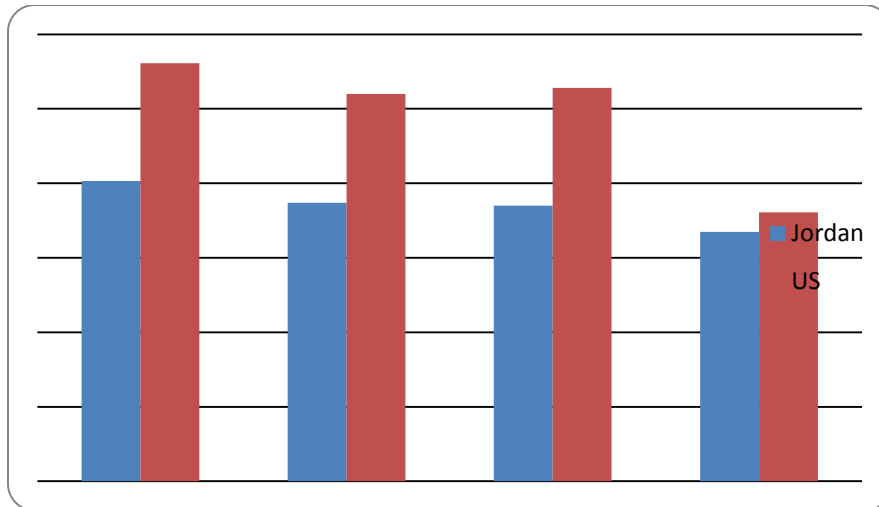


Figure 6. Mean participant beliefs scores by country.

**H1c.** Final analyses for Aim 1 evaluated the feeding preference/ benefit rank scores by country. The only rank score that significantly differed by country was NGT feeding. In general, US participants ranked NGT feeding higher than Jordanian participants. Although not significant at  $\alpha = 0.05$ , there was a marginally significant effect for breast feeding rank score. For breast feeding, Jordanian participants rank score was higher than US participants rank score.

Table 11. Feeding Preference/Benefit Rank by Country

Preference/ benefit Rank Score	Country	N	Mean	SD	t
Breast Feeding	Jordan	84	2.92	.30	1.90 <sup>†</sup>
	US	69	2.83	.31	
Bottle Feeding	Jordan	85	2.86	.28	0.06
	US	70	2.86	.40	
NGT Feeding	Jordan	85	2.66	.32	-2.06*
	US	69	2.76	.29	
Cup Feeding	Jordan	85	2.71	.35	1.13
	US	69	2.65	.31	

<sup>†</sup> $p \leq .10$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

Note: higher scores indicated higher preference/ benefit rank.

**H1d.** Analyses evaluating the relation between country and health care provider preference and practice were performed on the following interval level variables: cup feeding frequency, how often participants taught parents about cup feeding, participants cup feeding

success score, parent cup-feeding success score and overall cup feeding use score. In addition, the following dichotomous preference and performance indicators were assessed: if participants had heard about cup feeding (yes/no), had ever cup fed a stable preterm infant (yes/no), if the felt parents preferred cup feeding (yes/no), and if they would consider using cup feeding as an alternative to bottle or NGT feeding (yes/no).

T-test analyses revealed no differences in participant report of cup feeding frequency, parent training frequency, or participant or parent cup feeding success. These analyses have to be taken with caution due to the small sample size for the Jordanian participants. Very few participants had ever cup-fed an infant in the past and were unable to respond to many of these questions. This effect is seen in the overall cup feeding score. US participants had higher overall cup feeding scores than the Jordanian participants (Table 12).

Table 12. Feeding Preference and Practice by Country: Interval Variables.					
Cup Feeding	Country	N	Mean	SD	t
Cup Feeding Frequency	Jordan	7	2.14	.69	-1.52
	US	39	3.69	2.67	
Parent Training Frequency	Jordan	6	3.50	2.74	0.24
	US	39	3.21	2.76	
Participant Cup Feeding Success	Jordan	7	3.29	.76	1.06
	US	38	2.74	1.33	
Parent Cup Feeding Success	Jordan	7	3.00	.82	1.11
	US	39	2.46	1.23	
Overall Cup Feeding Score	Jordan	84	1.90	1.49	-4.30***
	US	70	3.19	2.20	

†p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

Analysis of feeding preference and practice dichotomous level variables supported the interpretation of the preference and practice interval level variables (Table 13). Fewer Jordanian participants had heard about cup feeding a stable preterm infant (38.6%) and fewer had fed a stable preterm infant (13.3%) in comparison to US participants (heard about: 97.1%; ever fed:

52.2%). However when asked about parent preference, more Jordanian participants reported higher frequency of parent preference (71.1%) than US participants (45.6%). Even though Jordanian participants felt parents preferred cup feeding, fewer Jordanian participants indicated that they would consider cup feeding (37.3%) in comparison to US potential to use cup feeding (57.1%).

Table 13. Feeding Preference and Practice by Country: Yes/No Variables.				
Cup Feeding		Jordan N=83	US N=69	$\chi^2$
Heard About	No	32	2	27.59***
	Yes	51	67	
Ever Fed	No	47	33	20.48***
	Yes	7	36	
Parents Prefer	No	24	37	9.28 **
	Yes	59	31	
Would Consider	No	52	30	5.98**
	Yes	31	40	

<sup>†</sup>p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

**Summary of Aim 1 Analyses.** In summary, the US sample had more knowledge and positive beliefs regarding all feeding types. Both US and Jordanian participants viewed breastfeeding most favorably. Participants from both countries reported the least amount of knowledge and lowest preference for cup feeding. US participants reported higher overall cup feeding scores and indicated that they would be more likely to use cup feeding in the future, but Jordanian participants reported higher rates of parental preference for cup feeding.

**Aim 2.** To identify if there are differences between nurses and physicians in regards to a) knowledge, beliefs, and preference/benefits rank regarding preterm infant feeding types, and b) past behavior regarding using cup feeding.

H2a: Nurses have higher scores of knowledge than physicians regarding preterm infant feeding types.

H2b: Nurses have higher scores of beliefs than physicians regarding preterm infant feeding types.

H2c: Nurses have higher scores of preference/benefits rank of preterm infant feeding types than physicians.

H2d: Nurses have higher scores of past behavior regarding using cup feeding than physicians.

Similar to Aim 1, to evaluate hypotheses H2a, H2b, H2c, and H2d, t-tests using a 2-group occupation variable (nurse vs. physician) were performed on all interval level measurements. In addition, for H2a and H2b, a MANOVA was performed to evaluate the effect of occupation across all feeding types. For these analyses, a table describing sample means and t-test statistics as well as graphical representation is provided. All dichotomous variables were assessed using  $\chi^2$  analysis. For all analyses, comparisons across all feeding types are performed first followed by analysis of all non-cup feeding specific measures. To keep the sample size consistent across study aims, as in Aim 1, although there were participants from other countries that provided data, the sample size is too small to allow for comparison, so only data from Jordan and US participants is included.

**H2a.** Analyses evaluating the relation between occupation type (nurse vs physician) and health care provider knowledge in infant feeding found differences in feeding knowledge by occupation type for breast feeding knowledge and cup feeding knowledge. There were no differences found for knowledge about bottle feeding or NGT feeding between nurses and physicians. For both breast feeding and cup feeding, physicians had more knowledge than



nurses (Table 14). A multivariate analysis revealed an overall significant effect of occupation type on feeding knowledge (Wilks' Lambda  $F = 3.23$ ,  $p = .014$ ).

Knowledge Scores	Occupation	N	Mean	SD	t
Breast Feeding	Nurse	141	2.31	.84	2.22*
	Physician	32	1.96	.67	
Bottle Feeding	Nurse	141	2.74	.77	-0.78
	Physician	32	2.85	.63	
NGT Feeding	Nurse	141	2.27	.98	0.41
	Physician	32	2.20	.71	
Cup Feeding	Nurse	141	2.97	.97	2.50*
	Physician	32	2.49	1.03	

<sup>†</sup> $p \leq .10$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

Note: lower scores indicated more knowledge.

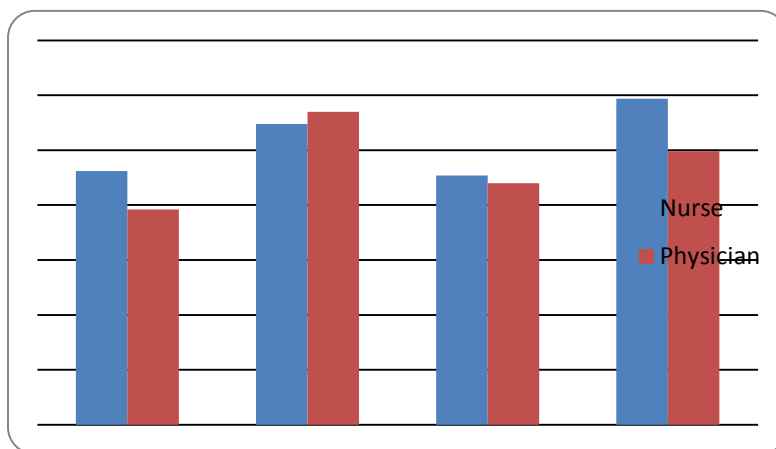


Figure 7. Mean participant knowledge scores by occupation.

**H2b.** Similar to hypothesis 2a, analyses evaluating the relation between occupation type (nurse vs physician) and health care provider beliefs in infant feeding found differences in nurse and physician beliefs about breast feeding and cup feeding. No differences were found in relation to beliefs about bottle feeding. Although not statistically significant at  $\alpha = 0.5$ , there was a marginally significant effect of beliefs regarding NGT feeding. For NGT feeding, physicians reported more positive beliefs than nurses ( $t = -1.87$ ,  $p = 0.064$ ). Similar to NGT feeding, for both breastfeeding and cup feeding, physicians also reported more positive beliefs than nurses. It

is important to note that this sample included a higher proportion of nurses than physicians (Table 15). MANOVA analyses identified an overall effect of occupation on feeding beliefs (Wilks' Lambda  $F = 8.7$ ,  $p < .001$ ).

Beliefs Scores	Occupation	N	Mean	SD	t
Breast Feeding	Nurse	141	4.67	1.06	-2.73***
	Physician	32	5.20	.75	
Bottle Feeding	Nurse	141	4.39	1.06	0.25
	Physician	32	4.34	.89	
NGT Feeding	Nurse	141	4.38	1.03	-1.87 <sup>†</sup>
	Physician	32	4.74	.78	
Cup Feeding	Nurse	141	3.40	.96	-4.45***
	Physician	32	4.29	1.29	

<sup>†</sup> $p \leq .10$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

Note: higher scores indicated more positive beliefs.

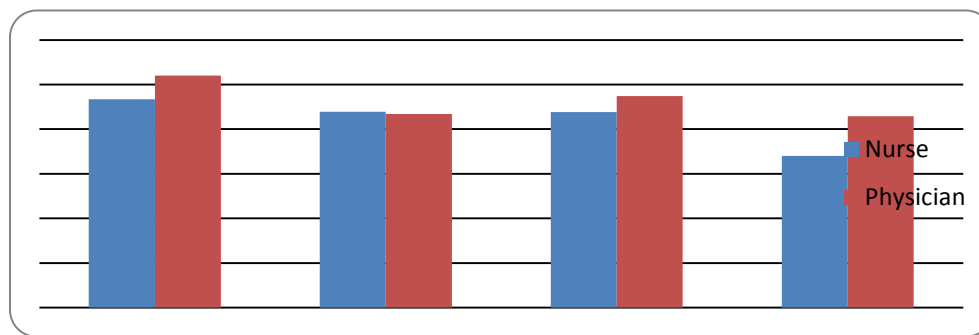


Figure 8. Mean participant belief score by occupation.

**H2c.** Final analyses for Aim 2 evaluated the feeding preference/ benefit rank scores by occupation (Table 16). Results revealed that there were no differences in preference/ benefit rank for any feeding types. Nurses and physician preference/ benefit rank were very similar for all feeding types.

Table 16. Feeding Preference/ Benefit Rank by Occupation.						
Preference/ benefit Rank Score	Occupation	N	Mean	SD	t	
Breast Feeding	Nurse	140	2.89	.30	1.42	
	Physician	30	2.81	.31		
Bottle Feeding	Nurse	142	2.84	.28	-1.64 <sup>†</sup>	
	Physician	30	2.95	.40		
NGT Feeding	Nurse	141	2.71	.32	-0.05	
	Physician	30	2.71	.29		
Cup Feeding	Nurse	141	2.68	.35	-0.84	
	Physician	30	2.74	.31		

<sup>†</sup>p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

Note: higher scores indicated higher preference/ benefit rank.

**H2d.** Similar to Aim 1, analyses evaluating the relation between occupation and health care provider preference and practice were performed on the following interval level variables: cup feeding frequency, how often participants taught parents about cup feeding, participants cup feeding success score, parent cup-feeding success score and overall cup feeding use score. In addition, the following dichotomous preference and performance indicators were assessed: if participants had heard about cup feeding (yes/no), had ever cup fed a stable preterm infant (yes/no), if the felt parents preferred cup feeding (yes/no), and if they would consider using cup feeding as an alternative to bottle or NGT feeding (yes/no).

T-test analyses revealed significant differences for all interval level variables regarding cup feeding preference and practice by occupation: participant report of cup feeding frequency, parent training frequency, or participant or parent cup feeding success, and overall cup feeding score. For all variables, physicians indicated a higher frequency. Physicians performed cup feeding more often, trained parents on how to cup feed more often, considered themselves and parents more successful, and had overall higher cup feeding preference and practice score than nurses (Table 17).

Table 17. Feeding Preference and Practice by Occupation: Interval Variables.

Cup Feeding	Occupation	N	Mean	SD	t
Cup Feeding Frequency	Nurse	45	3.00	2.05	-5.42***
	Physician	15	6.80	3.01	
Parent Training Frequency	Nurse	41	2.10	1.58	-11.34***
	Physician	15	7.73	1.83	
Participant Cup Feeding Success	Nurse	41	2.61	1.20	-3.92***
	Physician	14	4.00	0.96	
Parent Cup Feeding Success	Nurse	42	2.24	1.08	-5.91***
	Physician	16	4.00	0.82	
Overall Cup Feeding Score	Nurse	141	2.35	1.66	-5.56***
	Physician	31	4.52	3.00	

†p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

Although interval level variables found significant differences for all variables, the only significant difference for the dichotomous variables evaluated was future consideration of using cup feeding. In this analysis, more physicians (77%) indicated that they would consider cup feeding in the future than nurses (46%). Given this finding, it is interesting that nurses and physicians did not differ on parent preference (59% vs 74% respectively), hearing about cup feeding (78% vs 87% respectively) or whether they had cup fed stable pre-term infants in the past (34% vs 50% respectively). Although these differences were not significant, it is important to recognize that in all variables, physician rate was higher than nurse rate (Table 18).

Table 18. Feeding Preference/Practice by Occupation: Yes/No Variables.

Cup Feeding		Nurses N=140 <sup>a</sup>	Physicians N=31 <sup>a</sup>	$\chi^2$
Heard About	No	31	4	1.21
	Yes	108	26	
Ever Fed	No	74	13	2.17
	Yes	39	13	
Parents Prefer	No	56	8	2.43 <sup>†</sup>
	Yes	81	23	
Would Consider	No	76	7	10.21***
	Yes	64	24	

†p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

<sup>a</sup>Largest analysis sample size.

**Summary of Aim 2 Analyses.** In summary, physicians had more knowledge and positive beliefs regarding breast- and cup-feeding. Both nurses and physicians viewed breastfeeding most favorably and cup feeding the lowest favorably. Nurses reported the least amount of knowledge for cup feeding, while physicians reported the least amount of knowledge for bottle feeding. Physicians reported higher feeding preference and practice variables scores and indicated that they would be more likely to use cup feeding in the future.

**Aim 3.** To evaluate the relation between neonatal health care experience and a) knowledge, beliefs, and preference/benefits rank regarding preterm infant feeding types, and b) past behavior regarding using cup feeding.

H3a: There will be a positive relation between higher scores of knowledge regarding preterm infant feeding types and higher rates of neonatal experience among neonatal HCPs.

H3b: There will be a positive relation between higher scores of beliefs regarding preterm infant feeding types and higher rates of neonatal experience among neonatal HCPs.

H3c: There will be a positive relation between higher scores of preference/benefits rank of preterm infant feeding types and higher rates of neonatal experience among neonatal HCPs.

H3d: There will be a positive relation between higher scores of preference and past behavior regarding using cup feeding and higher rates of neonatal experience among neonatal HCPs.

Similar to Aims 1 and 2, to evaluate hypotheses H3a, H3b, H3c, and H3d, t-tests using a 2-group neonatal experience variable were performed on all interval level measurements. As mentioned in the Methods Chapter, neonatal experience was dichotomized into  $< 10$  years and  $\geq$

10 years. In addition, for H3a and H3b, a MANOVA was performed to evaluate the effect of neonatal experience across all feeding types. For these analyses, a table describing sample means and t-test statistics as well as graphical representation is provided. All dichotomous variables were assessed using  $\chi^2$  analysis. For all analyses, comparisons across all feeding types are performed first followed by analysis of all non-cup feeding specific measures. To keep the sample size consistent across study aims, as in Aims 1 and 2, although there were participants from other countries that provided data, the sample size is too small to allow for comparison, so only data from Jordan and US participants is included.

**H3a.** Analyses evaluating the relation between 2-group neonatal experience and health care provider knowledge in infant feeding found differences in feeding knowledge by neonatal experience group for all feeding types (Table 19). For all feeding types, health care providers who reported at least 10 years of neonatal experience reported higher knowledge scores than health care providers with < 10 years of neonatal experience. A multivariate analysis revealed an overall significant effect of experience on knowledge (Wilks' Lambda  $F = 12.7$ ,  $p < .001$ ).

Knowledge Scores	Experience	N	Mean	SD	t
Breast Feeding	< 10 years	89	2.54	0.84	5.31***
	≥ 10 years	82	1.92	0.66	
Bottle Feeding	< 10 years	89	2.87	0.73	2.14*
	≥ 10 years	82	2.63	0.76	
NGT Feeding	< 10 years	89	2.62	0.96	5.97***
	≥ 10 years	82	1.84	0.71	
Cup Feeding	< 10 years	89	3.12	0.86	3.48***
	≥ 10 years	82	2.60	1.07	

†  $p \leq .10$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

Note: lower scores indicated more knowledge.

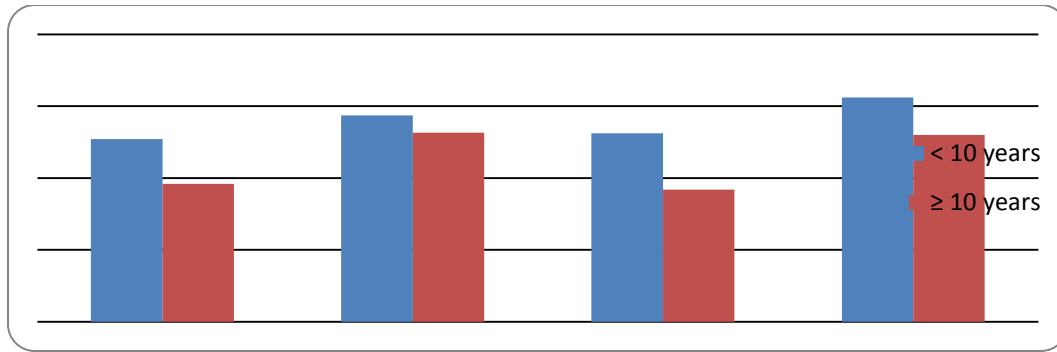


Figure 9. Mean participant knowledge scores by experience group.

**H3b.** Analyses evaluating the relation between experience group and health care provider beliefs in infant feeding found differences in beliefs about breast feeding, bottle, and NGT feeding. For these feeding types, more positive beliefs were reported by participants with at least 10 years of neonatal health care experience (Table 20). Although not statistically significant at  $\alpha = 0.5$ , there was a marginally significant effect of beliefs regarding cup feeding. For cup feeding, increased experience was related to more positive beliefs about cup feeding ( $t = -1.81$ ,  $p = 0.072$ ). MANOVA analyses identified an overall effect of occupation on feeding beliefs (Wilks' Lambda  $F = 33.4$ ,  $p < .001$ ).

Table 20. Feeding Beliefs by 2-group Experience.

Beliefs Scores	Experience	N	Mean	SD	t
Breast Feeding	< 10 years	89	4.17	0.93	-10.74***
	≥ 10 years	82	5.48	0.63	
Bottle Feeding	< 10 years	89	3.90	0.95	-7.80***
	≥ 10 years	82	4.97	0.83	
NGT Feeding	< 10 years	89	3.89	0.91	-9.51***
	≥ 10 years	82	5.08	0.70	
Cup Feeding	< 10 years	89	3.44	0.70	-1.81 <sup>†</sup>
	≥ 10 years	82	3.74	1.35	

<sup>†</sup> $p \leq .10$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

Note: higher scores indicated more positive beliefs.

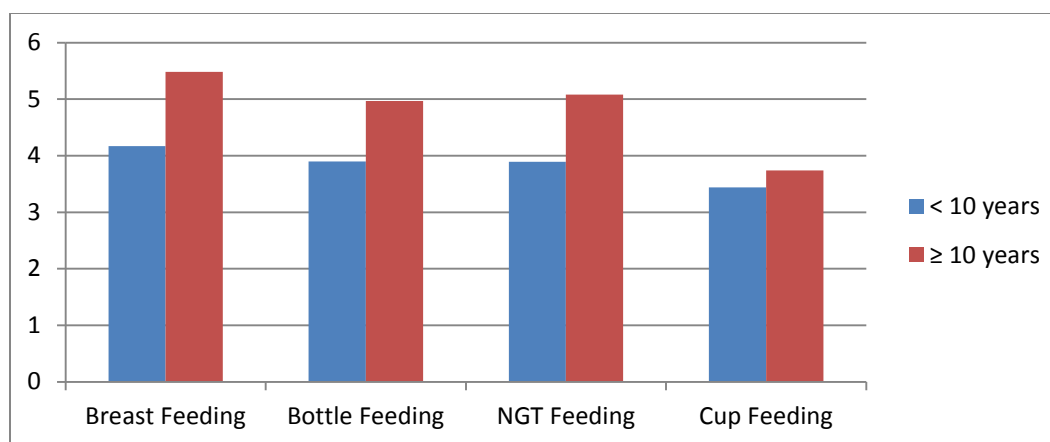


Figure 10. Mean participant belief score by experience group.

**H3c.** Final analyses for Aim 3 evaluated the feeding preference/ benefit rank scores by 2-group neonatal experience (Table 21). Results revealed that there were no significant differences in preference/ benefit rank for any feeding type by experience. Although not significant at  $\alpha = 0.05$ , there was a marginally significant effect for breast feeding rank score. For breast feeding, participants with at least 10 years of experience rank score was higher than participants with less than 10 years of experience.

Table 21. Feeding Preference/ Benefit Rank by Experience.

Preference/ benefit Rank Score	Experience	N	Mean	SD	t
Breast Feeding	< 10 years	88	2.90	0.31	1.30
	≥ 10 years	80	2.84	0.31	
Bottle Feeding	< 10 years	90	2.84	0.38	-0.92
	≥ 10 years	80	2.89	0.31	
NGT Feeding	< 10 years	89	2.67	0.33	-1.91 <sup>†</sup>
	≥ 10 years	80	2.76	0.30	
Cup Feeding	< 10 years	89	2.70	0.34	-0.50
	≥ 10 years	80	2.67	0.32	

<sup>†</sup>  $p \leq .10$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

Note: higher scores indicated higher preference/ benefit and rank.

**H3d.** Similar to Aims 1 and 2, analyses evaluating the relation between 2-group experience and health care provider preference and practice were performed on the following



interval level variables: cup feeding frequency, how often participants taught parents about cup feeding, participants cup feeding success score, parent cup-feeding success score and overall cup feeding use score. In addition, the following dichotomous preference and performance indicators were assessed: if participants had heard about cup feeding (yes/no), had ever cup fed a stable preterm infant (yes/no), if the felt parents preferred cup feeding (yes/no), and if they would consider using cup feeding as an alternative to bottle or NGT feeding (yes/no).

T-test analyses revealed significant differences for participant report of cup feeding frequency and overall cup feeding score. For both cup feeding variables, participants with at least 10 years of neonatal health care experience indicated a higher frequency of cup feeding practice and preference (Table 22). There were no differences in parent training, parent success, or participant success in cup feeding by experience group. It is important to note that Standard Deviations were high for all these variables.

Cup Feeding	Experience	N	Mean	SD	t
Cup Feeding Frequency	< 10 years	15	2.93	1.58	-2.16*
	≥ 10 years	44	4.27	3.09	
Parent Training Frequency	< 10 years	14	2.86	2.14	-0.98
	≥ 10 years	44	3.75	3.19	
Participant Cup Feeding Success	< 10 years	14	2.79	0.98	-0.48
	≥ 10 years	43	2.98	1.37	
Parent Cup Feeding Success	< 10 years	15	2.47	1.06	-0.75
	≥ 10 years	45	2.76	1.35	
Overall Cup Feeding Score	< 10 years	89	2.16	1.55	-4.18***
	≥ 10 years	81	3.46	2.44	

†p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

Analyses of cup feeding preference and practice dichotomous variables revealed significant differences for heard about cup feeding and ever fed a stable pre-term infant (Table 23). Participants with at least 10 years of neonatal health care experience had a higher rate of

hearing about cup feeding (96.2%) in comparison to those with less than 10 years of experience (68.2%). Results were similar for past practice of cup feeding (51.9% vs 21.9% respectively). Although not significant at  $\alpha = 0.05$ , a similar trend was found for future use of cup feeding ( $\chi^2 = 3.17$ ,  $p = 0.075$ ). Participants with at least 10 years of neonatal health care experience reported a higher rate of intention for future cup feeding practice (58%) in comparison to participants with less than 10 years of neonatal health care experience (44.3%).

Table 23. Feeding Preference/Practice by Experience: Yes/No Variables.				
Cup Feeding		< 10 years N=88 <sup>a</sup>	≥ 10 years N=81 <sup>a</sup>	$\chi^2$
Heard About	No	28	3	21.62***
	Yes	60	76	
Ever Fed	No	50	37	13.38***
	Yes	14	40	
Parents Prefer	No	29	34	1.99
	Yes	59	44	
Would Consider	No	49	34	3.17 <sup>†</sup>
	Yes	39	47	

<sup>†</sup>  $p \leq .10$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

<sup>a</sup>Largest analysis sample size.

**Summary of Aim 3 Analyses.** In summary, participants with at least 10 years of neonatal experience had more knowledge and positive beliefs regarding all feeding types and reported higher overall cup feeding scores, more frequent use of cup feeding, and indicated that they would be more likely to use cup feeding in the future. Participants, regardless of their experience, viewed breastfeeding most favorably.

**Aim 4.** To evaluate the relation between NICU HCPs' education and a) knowledge, beliefs, and preference/benefits rank regarding preterm infant feeding types, and b) past behavior regarding using cup feeding.

H4a: There will be a positive relation between higher scores of knowledge regarding preterm infant feeding types and higher level of education among NICU HCPs.

H4b: There will be a positive relation between higher scores of beliefs regarding preterm infant feeding types and higher level of education among NICU HCPs.

H4c: There will be a positive relation between higher scores of preference/benefits rank of preterm infant feeding types and higher level of education among NICU HCPs.

H4d: There will be a positive relation between higher scores of preference and past behavior regarding using cup feeding and higher level of education among NICU HCPs.

Similar to Aims 1 and 2, to evaluate hypotheses H4a, H4b, H4c, and H4d, t-tests using a 2-group degree variable were performed on all interval level measurements. As mentioned in the Methods Chapter, degree type was dichotomized into BSN or less vs advanced (MS or Doctoral). In addition, for H4a and H4b, a MANOVA was performed to evaluate the effect of degree type across all feeding types. For these analyses, a table describing sample means and t-test statistics as well as graphical representation is provided. All dichotomous variables were assessed using  $\chi^2$  analysis. For all analyses, comparisons across all feeding types are performed first followed by analysis of all non-cup feeding specific measures. To keep the sample size consistent across study aims, as in Aims 1-3, although there were participants from other countries that provided data, the sample size is too small to allow for comparison, so only data from Jordan and US participants is included.

**H4a.** Analyses evaluating the relation between 2-group degree type and health care provider knowledge in infant feeding found differences in feeding knowledge by degree type for all feeding types (Table 24). For all feeding types, health care providers with an advanced degree reported higher knowledge scores than health care providers with a BSN or less. A

multivariate analysis revealed an overall significant effect of degree type on feeding knowledge (Wilks' Lambda  $F = 11.0$ ,  $p < .001$ ).

Table 24. Feeding Knowledge by 2-group Degree Type.					
Knowledge Scores	Degree	N	Mean	SD	t
Breast Feeding	≤ BSN	96	2.53	0.84	5.50***
	Advanced	79	1.89	0.66	
Bottle Feeding	≤ BSN	96	2.87	0.74	4.15***
	Advanced	79	2.60	0.74	
NGT Feeding	≤ BSN	96	2.50	1.04	3.80***
	Advanced	79	1.94	0.66	
Cup Feeding	≤ BSN	96	3.13	0.82	3.03***
	Advanced	79	2.58	1.10	

<sup>†</sup> $p \leq .10$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

Note: lower scores indicated more knowledge.

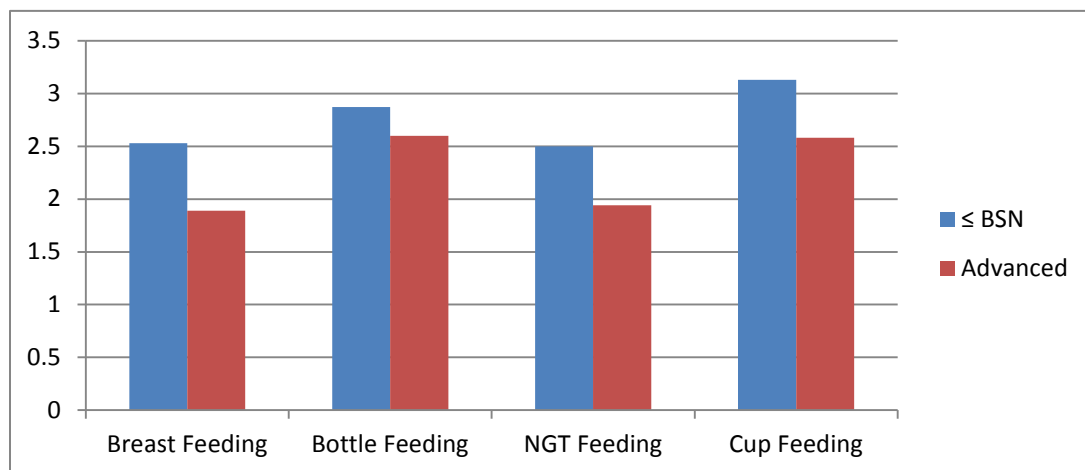


Figure 11. Mean participant knowledge scores by experience group.

**H4b.** Analyses evaluating the relation between degree type and health care provider beliefs in infant feeding found differences in beliefs for all feeding types. For all feeding types, more positive beliefs were reported by participants with an advanced degree (Table 25). MANOVA analyses identified an overall effect of degree type on feeding beliefs (Wilks' Lambda  $F = 19.4$ ,  $p < .001$ ).

Table 25. Feeding Beliefs by 2-group Degree Type.

Beliefs Scores	Degree	N	Mean	SD	t
Breast Feeding	≤ BSN	96	4.30	0.98	-7.80***
	Advanced	79	5.36	0.76	
Bottle Feeding	≤ BSN	96	4.05	0.99	-5.40***
	Advanced	79	4.83	0.93	
NGT Feeding	≤ BSN	96	4.03	0.98	-7.13***
	Advanced	79	4.98	0.75	
Cup Feeding	≤ BSN	96	3.35	0.71	-2.95**
	Advanced	79	3.82	1.36	

†p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

Note: higher scores indicated more positive beliefs.

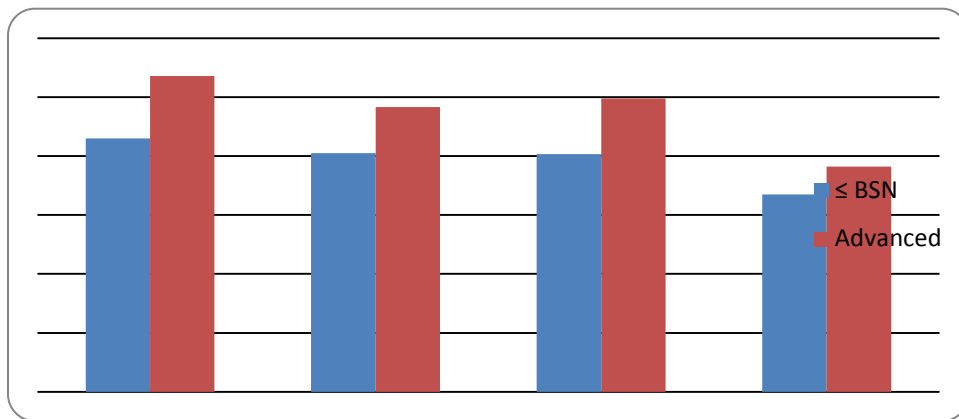


Figure 12. Mean participant belief score by experience group.

**H4c.** Final analyses for Aim 4 evaluated the feeding preference/ benefit rank scores by degree type (Table 26). Results revealed that advanced degree participants preference/ benefit rank for NGT feeding was higher than participants with a BSN or less. No significant differences were found for bottle feeding preference/ benefit rank by degree type. Although not significant at  $\alpha = 0.05$ , there was a marginally significant effect for both breast feeding and cup feeding preference/ benefit rank score. For both breast feeding and cup feeding, participants a BSN or less reported high rank scores than participants with an advanced degree.

Table 26. Feeding Preference/ benefit Rank by Degree Type.						
Preference/ benefit Rank Score	Degree	N	Mean	SD	t	
Breast Feeding	≤ BSN	95	2.91	0.30	1.74 <sup>†</sup>	
	Advanced	77	2.83	0.31		
Bottle Feeding	≤ BSN	97	2.83	0.33	-1.25	
	Advanced	77	2.90	0.36		
NGT Feeding	≤ BSN	96	2.65	0.30	-2.78**	
	Advanced	77	2.78	0.31		
Cup Feeding	≤ BSN	96	2.73	0.33	1.74 <sup>†</sup>	
	Advanced	77	2.64	0.31		

<sup>†</sup>p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

Note: higher scores indicated higher preference/ benefit and rank.

**H4d.** Similar to Aims 1-3, analyses evaluating the relation between degree type and health care provider preference and practice were performed on the following interval level variables: cup feeding frequency, how often participants taught parents about cup feeding, participants cup feeding success score, parent cup-feeding success score and overall cup feeding use score. In addition, the following dichotomous preference and performance indicators were assessed: if participants had heard about cup feeding (yes/no), had ever cup fed a stable preterm infant (yes/no), if the felt parents preferred cup feeding (yes/no), and if they would consider using cup feeding as an alternative to bottle or NGT feeding (yes/no).

T-test analyses revealed significant differences for participant report of cup feeding frequency, cup-feeding teaching frequency, parent cup feeding success and overall cup feeding score (Table 27). For participant cup feeding success, the effect was only marginally significant ( $t = 1.71$ ,  $p = 0.093$ ). For all variables, participants with an advanced degree reported higher rates of cup feeding preference and practice. As seen in prior analyses, Standard Deviations were high for all variables.

Table 27. Feeding Preference and Practice by Degree Type: Interval Variables.

Cup Feeding	Degree	N	Mean	SD	t
Cup Feeding Frequency	≤ BSN	19	2.74	1.52	-2.32*
	Advanced	40	4.50	3.14	
Parent Training Frequency	≤ BSN	18	2.00	1.24	-2.79**
	Advanced	40	4.23	3.27	
Participant Cup Feeding Success	≤ BSN	19	2.53	1.26	-1.71 <sup>†</sup>
	Advanced	38	3.13	1.26	
Parent Cup Feeding Success	≤ BSN	19	2.11	0.99	-2.75**
	Advanced	41	2.95	1.32	
Overall Cup Feeding Score	≤ BSN	96	2.18	1.44	-3.97***
	Advanced	78	3.41	2.59	

<sup>†</sup>p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

Analyses of cup feeding preference and practice dichotomous variables revealed significant differences for all dichotomous cup feeding practice and preference variables (Table 28). Participants with an advanced degree heard about cup feeding more (89% vs. 72%), had previously fed a stable pre-term infant (54% vs. 24%), and reported a higher likelihood of using cup feeding in the future (52% vs. 42%). In contract, participants with an advanced degree reported a lower frequency of parent preference for cup feeding (53% vs. 68%).

Table 28. Feeding Preference/Practice by Experience: Yes/No Variables.

Cup Feeding		≤ BSN N=96 <sup>a</sup>	Advanced N=78 <sup>a</sup>	$\chi^2$
Heard About	No	27	8	7.88**
	Yes	69	67	
Ever Fed	No	55	32	13.43***
	Yes	17	37	
Parents Prefer	No	30	36	4.23*
	Yes	64	40	
Would Consider	No	55	30	6.47**
	Yes	40	48	

<sup>†</sup>p ≤ .10. \*p ≤ .05. \*\*p ≤ .01. \*\*\*p ≤ .001.

<sup>a</sup>Largest analysis sample size.

**Summary of Aim 4 Analyses.** In summary, participants with an advanced degree had more knowledge and positive beliefs regarding all feeding types. Participants, regardless of their

degree, viewed breastfeeding most favorably and cup feeding least favorably. Participants with advanced degree reported higher feeding preference and practice variables scores and indicated that they would be more likely to use cup feeding in the future, but participants with a BSN or less reported higher rates of parental preference for cup feeding.

### **Multivariable Analyses**

In this section of the chapter, multivariable analyses will be discussed. All outcome measures (knowledge, beliefs, and cup-feeding specific variables) were examined. Planned analyses included examining all outcome variables in an ANOVA using the following: 2-group country (US vs. Jordan), 2-group degree ( $\leq$  BSN vs. advanced degree), Occupation (nurse vs. physician), and 2-group neonatal experience ( $< 10$  years vs.  $\geq 10$  years). This analysis would have allowed for an examination of all potential interactions. These analyses were not possible given the small sample size for physicians ( $N=32$ ). While performing the  $2 \times 2 \times 2 \times 2$  ANOVA, there are mutually exclusive cells. In order to be a physician, you have to have an advanced degree. All remaining cells had sample sizes less than equal to five. In addition, even if occupation is removed from the analysis, there are no individuals with an advanced degree in Jordan who have had at least 10 years of neonatal care experience. Thus for multivariable analyses regression analyses were performed.

Ethnicity, gender, and age were planned study covariates. After an examination of the data, none were included. Ethnicity was not included due to a high level of overlap between country and ethnicity; 100% of Jordanian participants were Arabic and 87% of US participants were white. Only 10% of the sample was male, thus gender was not included. Age was not



included in the regression analyses, as the sample size would drop from 148 to 118. Age was missing for 30 study participants.

**Knowledge.** Regression analyses (forward entry, probability of F to enter  $\leq 0.05$ ) were performed for each feeding type. Results revealed that with the exception of breast feeding, country uniquely predicted knowledge while controlling for occupation, experience, and degree (Table 29). Country was the only predictor that was significant for bottle feeding, NGT feeding, and cup feeding, with US participants having higher levels of knowledge. For all feeding types, occupation did not predict a unique amount of feeding type knowledge variance. Importantly, more than 1/4<sup>th</sup> (26%) of the variance in NGT feeding knowledge was accounted for by country. In contrast, country did not predict breast feeding knowledge. Both experience and degree accounted for a significant amount of unique variance; more experience and an advance degree were related to higher levels of knowledge. The model evaluating breast feeding knowledge accounted for 20% of the breast feeding knowledge variance.

Table 29. Knowledge Regression Analyses (N=148).					
	Country	Occupation	Experience	Degree	Model
	$\beta$	$\beta$	$\beta$	$\beta$	$R^2$
Breast Feeding	-0.11	-0.3	-0.26**	-0.24**	0.20
Bottle Feeding	-0.24**	0.09	0.10	-0.2	0.06
NGT Feeding	-0.51***	0.07	-0.10	0.02	0.26
Cup Feeding	-0.31***	-0.13	0.02	-0.12	0.09
†p $\leq$ .10. *p $\leq$ .05. **p $\leq$ .01. ***p $\leq$ .001.					

**Beliefs.** Regression analyses (forward entry, probability of F to enter  $\leq 0.05$ ) were performed for each feeding type. For all feeding types, experience and degree did not predict a unique amount of feeding type belief variance (Table 30). Occupation uniquely predicted bottle feeding and cup feeding. Physicians reported more positive beliefs about cup feeding than nurses and nurses reported more positive beliefs about bottle feeding than physicians. Regression

models for Breast feeding, bottle feeding, and NGT feeding accounted for more than 50% of the variance.

Table 30. Beliefs Regression Analyses (N=148).					
	Country	Occupation	Experience	Degree	Model
	$\beta$	$\beta$	$\beta$	$\beta$	$R^2$
Breast Feeding	0.75***	0.03	0.15	0.06	0.56
Bottle Feeding	0.73***	-0.13*	-0.06	0.07	0.51
NGT Feeding	0.78***	-0.06	-0.12	-0.02	0.61
Cup Feeding	0.05	0.33***	0.04	0.07	0.10
†p ≤ .10. *p ≤ .05. **p ≤ .01. ***p ≤ .001.					

**Cup Feeding Practice and Preference Variables.** Regression analyses (forward entry, probability of F to enter ≤ 0.05) were performed for all interval level cup-feeding variables. For all feeding types, experience and degree did not predict a unique amount of cup feeding practice or preference variance (Table 31). Country uniquely predicted the overall cup feeding score, but not cup feeding frequency, parent training, or success (parent or self). The US reported higher levels of overall cup feeding practice and preference than Jordan. In contrast, Occupation uniquely predicted all practice and preference variables. Being a physician was related to increased cup feeding frequency, parent training, successful cup feeding for themselves and parents, as well as an overall cup higher feeding preference and practice score.

Table 31. Cup Feeding Regression Analyses.					
	Country	Occupation	Experience	Degree	Model
	$\beta$	$\beta$	$\beta$	$\beta$	$R^2$
Cup Feeding Frequency	0.21†	0.60***	0.15	0.14	0.36
Parent Training Frequency	-0.04	0.43**	-0.11	0.04	0.19
Participant Cup Feeding Success	-0.17	0.57***	-0.13	0.03	0.61
Parent Cup Feeding Success	0.05	0.33***	0.04	0.07	0.32
Overall Cup Feeding Score	0.26***	0.31***	-0.05	-0.15	0.19
†p ≤ .10. *p ≤ .05. **p ≤ .01. ***p ≤ .001.					

**Feeding Preference/ benefit Rank Scores.** Regression analyses (forward entry, probability of F to enter  $\leq 0.05$ ) were performed for preference/ benefit rank score for all feeding types. In all analyses, country, occupation, and experience did not predict a unique amount of cup feeding practice or preference/ benefit variance (Table 31). Degree Type did uniquely predict breast feeding, NGT feeding, and cup feeding. An advanced degree was related to a higher rank score for NGT feeding, but a lower rank score for both breast feeding and cup feeding. Information is not provided for bottle feeding as no variables were entered into the model.

Table 32. Preference/ benefit Rank Regression Analyses (N=148).					
	Country	Occupation	Experience	Degree	Model
	$\beta$	$\beta$	$\beta$	$\beta$	$R^2$
Breast Feeding	-0.05	-0.07	-0.01	-0.20*	0.04
Bottle Feeding	--	--	--	--	--
NGT Feeding	0.06	-0.05	0.01	0.19*	0.04
Cup Feeding	0.06	0.10	0.04	-0.17*	0.03
†p ≤ .10. *p ≤ .05. **p ≤ .01. ***p ≤ .001.					

### Regression Analyses Summary

Multivariable regression analysis was run on the predictor variables (i.e. Country, occupation, neonatal experience, and education) in order to see the unique relationships of each predictor. In controlled analyses, country uniquely predicted knowledge regarding types of feeding, except for breast feeding (Table 29), it uniquely predicted beliefs regarding types of feeding, except for cup feeding, and overall cup feeding score, but not cup feeding frequency, parent training, or success (Table 30). Both experience and degree accounted for a 20% of breast feeding knowledge variance. Also, occupation uniquely predicted bottle feeding and cup feeding beliefs, and uniquely predicted all practice and preference variables. In addition, degree type uniquely predicted breast feeding, NGT feeding and cup feeding.

On the other hand, occupation did not predict a unique amount of feeding type knowledge variance for all feeding types. Also, experience and degree did not predict a unique amount of feeding type belief variance for all feeding types and for amount of cup feeding practice or preference variance. Moreover, country, occupation, and experience did not predict a unique amount of cup feeding practice or preference.

## **CHAPTER 5**

### **DISCUSSION**

This chapter discusses the study findings. This discussion includes the findings related to the research hypotheses, limitations of the research, conclusion, and implications and recommendations for future research.

This study was conducted to evaluate the influence of country (Jordan vs. US), occupation (nurse vs. physician), experience, and education on NICU health care provider's (HCP): (a) knowledge, (b) beliefs, (c) preference, and (d) behavior regarding feeding of preterm stable infants.

#### **Health Care Providers' Feeding Type Knowledge and Beliefs**

As expected, health care providers (HCPs) had less knowledge and higher levels of negative beliefs regarding cup feeding in comparison to all other feeding types. HCPs also ranked cup feeding as having the least amount of benefit to stable preterm infants and preferred it less than all other feeding types. These results support the findings that HCPs do not consider cup feeding as a good alternative to breast feeding for stable preterm infants (Collins et al, 2004; Flint, 2008, and Aloysius and Hickson, 2007). HCPs' negative consideration of cup feeding is consistent with their low rate of cup feeding use. This behavior is consistent with the Knowledge-Attitude-Behavior (KAB) model which suggests that if an individual does not have an acceptable amount of knowledge regarding a recommended practice, they will perceive it poorly and not perform the behavior.

In regards to other feeding types, the most positively perceived feeding type was breast feeding. HCPs also saw bottle feeding as beneficial for stable preterm infants. Although HCP

beliefs regarding NGT feeding were similar to beliefs regarding bottle feeding, bottle feeding received higher rank preference scores than NGT feeding. Suggesting that overall, bottle feeding is more preferred over NGT feeding. This preference for bottle feeding is consistent with the previously identified high rates of bottle feeding in NICUs and staff reported preference of bottle feeding over all other feeding types (Bandara et al., 2012; Flint, 2008, Lambert & Watters, 1998, and APA, 1997)

Similar to bottle feeding, breastfeeding was viewed more positively than NGT feeding. Although there was a difference in preference between NGT and breast feeding, levels of knowledge surrounding the two feeding types were similar. Similar knowledge level could be due to an increase focus on both breast feeding and NGT feeding in NICUs, which ultimately increases HCP knowledge. This finding contradicts what would be expected by the KAB model. According to KAB, higher topic knowledge should result in a more positive attitude and ultimately practice.

### **Health Care Providers' Cup Feeding Preference and Practice**

Only one third of HCPs had previously cup-fed a stable pre-term infant. Of those who did, approximately half did not have a successful experience. Consistent with a low use rate and little positive experiences, less than one third frequently taught parents to cup feed their infant and less than half of those that had reported a successful parent teaching experience. One possible explanation for the low report of successful cup feeding practices is provided by the KAB model. Limited cup feeding knowledge resulted in an increase in negative attitudes and beliefs, which in turn resulted in lower cup feeding practice. A potential solution would be to provide education regarding the proper use of cup feeding for stable pre-term infants.

In consistent with low use rates and negative attitudes regarding cup feeding is the reported rates of high parental cup feeding preference. Since only half of the sample indicated that they would consider using cup feeding, this suggests that parent preference is not an important consideration when determining the method of feeding in practice.

### **The Impact of Culture on Feeding Type Knowledge and Beliefs**

In regards to all feeding types, HCPs in Jordan had less knowledge and reported higher levels of negative beliefs than US HCPs. Ideally, all HCPs, regardless of location, should have a similar level of patient care knowledge. Although this difference rate of knowledge should be explored in future research, one potential explanation is related to the confounding of predictors in this sample. Almost two thirds of Jordan sample study participants (60%) were below the age of 30, making 95.2 % of the Jordanian participants with less than 10 years of experience, compared to only 4% of the U.S. sample were below the age of 30 making 90% of the U.S. participants with more than 10 years of experience. In addition, the majority of the Jordanian participants (87.4%) were nurses with a BSN or less compared to most of the U.S. sample (72.9%) who had an advanced degree. Thus, it is not all that surprising that there was less knowledge regarding all feeding types in the younger, less experienced, less educated sample.

Although there was a differential level of knowledge and beliefs regarding all feeding types, no difference was found by country in terms of the beneficial effects of breast feeding, bottle feeding, or cup feeding. In contrast, NGT feeding was ranked as lower in preference and potential infant benefit among Jordanian HCPs than US HCPs. This difference could be due to differential NGT feeding methods. In Jordan, pumps are not used for NGT feeding. Nurses are still required to manually NGT feed infants, while in US hospitals, automatic pumps are used.

This method difference might explain Jordan participant view that NGT feeding is time consuming and increases nurse workload (both items are on the preference scale).

It was surprising however that Jordanian participants had less knowledge and more negative beliefs regarding cup feeding than US participants. In most developing countries health institutions follow WHO guidelines when writing health care policy. As the WHO recommends cup feeding, this might have suggested an increased level of knowledge in Jordan. Again, this difference was not found.

### **The Impact of Culture on Cup Feeding Preference and Practice**

In this study, country uniquely predicted overall cup feeding preference and practice. HCPs in US had higher preference and practice scores than Jordanian HCPs. This included hearing about cup feeding and an increased willingness for future use. In contrast, Jordanian HCP reported lower use rates and increased negative attitudes regarding cup feeding, yet reported higher rates of parental preference. This suggests that parent preference in Jordan is not an important consideration when determining the method of feeding in practice as it is in the US. The Jordanian HCP data is consistent with the KAB model. Jordanian HCPs had less knowledge, reduced preference and use rate, and increased negative beliefs, regarding cup feeding.

### **The Impact of Occupation on Feeding Type Knowledge and Beliefs**

The least positively perceived feeding type by both nurses and physicians was cup feeding. This result supports the findings of Collins et al, (2004), Flint (2008), and Aloysius and Hickson (2007). Surprisingly, nurses reported the least amount of knowledge for cup feeding, while physicians reported the least amount of knowledge for bottle feeding. This inconsistency of physicians' knowledge and belief (i.e. having the lowest knowledge in bottle feeding while



perceiving cup feeding as the least positively perceived feeding type) contradicts what would be expected by the KAB model.

Nurses had less knowledge and higher levels of negative beliefs regarding cup feeding than physicians. The low level of knowledge might explain why nurses ranked cup feeding as the least beneficial feeding type for stable preterm infants and preferred it less than all other feeding types. Physicians ranked NGT feeding as the least beneficial and preferred feeding type although they reported the least amount of knowledge for bottle feeding.

Physicians viewed breast feeding more positively than nurses and had higher knowledge scores. This result is similar to the findings of Molaison and Martin (2003) who found that physicians had more knowledge about breast feeding than nurses. The current data is not consistent with Bagwell et al. (1993) where no differences were found between nurses and physicians.

Although physicians had more knowledge and held more positive beliefs about breast feeding, nurses had more knowledge and were more positive about bottle feeding. This finding is consistent with other research that has identified frequent use of bottle feeding in the NICU and a nurse reported preference of bottle feeding over all other feeding types (Bandara et al., 2012).

### **The Impact of occupation on Cup Feeding Preference and Practice**

In this study, occupation predicted overall cup feeding preference and practice, cup feeding frequency and success, as well as parent training frequency and success. Physicians significantly performed cup feeding more often, trained parents on how to cup feed more often, considered themselves and parents more successful, had overall higher cup feeding preference and practice scores, and indicated that they would be willing to consider using cup feeding in the future more than nurses. This over all higher rates of past use of cup feeding among physicians in

comparison to nurses should be further investigated to assess if the physicians actually performed cup feeding and educated parents regarding cup feeding personally, or if they only ordered it. The questionnaire used in this study could be modified to distinguish between used cup feeding before”and ordered cup feeding before”. The low preference and use rates regarding cup feeding among nurses in this sample along with lower knowledge and increased rate of negative beliefs regarding cup feeding is consistent with what would be expected by the KAB model.

### **The Impact of Neonatal Experience on Feeding Type Knowledge and Beliefs**

Neonatal experience was related to feeding type knowledge and beliefs in this sample. For all feeding types, HCPs with less than 10 years of neonatal health care experience had lower knowledge scores and higher levels of negative beliefs than HCPs with at least 10 years of neonatal experience or more. Cup feeding was the feeding type with the most reported negative beliefs in both experience groups. This finding supports the research of others (Collins et al, 2004; Flint, 2008; Aloysius & Hickson, 2007). Both experience groups also agreed on the feeding type with the most positive beliefs; breast feeding. Although both experience groups had positive beliefs about breastfeeding, HCPs with < 10 years of neonatal experience had the most amount of knowledge about breast feeding. In contrast, the more experienced group, HCPs with  $\geq 10$  years of neonatal experience, were more knowledgeable about NGT feeding.

### **The Impact of Neonatal Experience on Cup Feeding Preference and Practice**

In the study sample, HCPs with at least 10 years or more of neonatal experience significantly performed cup feeding more often and had overall higher cup feeding preference and practice score than HCP with less than 10. The more experience group reported a higher rate of hearing about cup feeding as well as using cup feeding. Higher preference and use rates

regarding cup feeding among more experienced HCPs in conjunction with greater knowledge scores is consistent with the KAB model. Interestingly, although the more experienced group preferred and had practiced cup feeding more in the past, there was no difference between experience groups regarding future intention to perform cup feeding.

### **The Impact of Education on Feeding Type Knowledge and Beliefs**

Results of the current study found a relation between education on feeding knowledge and beliefs. For all feeding types, HCPs with a BSN or less had less knowledge and reported higher levels of negative beliefs than HCPs with an advanced degree. This is consistent with the KAB model and it is not surprising that more education is related to higher feeding type knowledge scores. HCPs with a BSN or less had lower knowledge scores and higher levels of negative beliefs regarding cup feeding than HCPs with an advanced degree.

Similar to experience, cup feeding was the least preferred feeding type by all HCPs in both education groups. The results are consistent with prior research that found that HCPs do not consider cup feeding as a good alternative to breast feeding for stable preterm infants (Collins et al, 2004; Flint, 2008; Aloysius & Hickson, 2007). Also consistent with results that evaluated the impact of experience, the most positively perceived feeding type, regardless of education, was breast feeding.

Interestingly, HCPs with BSN or less had the most amount of knowledge about NGT feeding, but the most amount of knowledge that HCPs with an advanced degree had was about breast feeding, consistent with their positive beliefs about breastfeeding, and in consistent with the KAB model.

NGT feeding was ranked as higher in preference and potential infant benefit among HCPs with advanced degree than with a  $\leq$  BSN. This difference is consistent with the findings

that HCPs with advanced degree had more amount of knowledge and positive beliefs regarding NGT feeding than HCP with a  $\leq$  BSN.

### **The Impact of Education on Cup Feeding Preference and Practice**

In this study, as expected, HCPs with an advanced degree heard about cup feeding more often than HCPs with a BSN or less. In addition, HCPs with an advanced degree performed cup feeding more often, trained parents how to cup feed more often, considered themselves more successful at cup feeding, considered parents more successful at cup feeding, and indicated that they would consider using cup feeding in the future. Although HCPs with an advanced degree reported higher cup feeding preference and practice scores, HCPs with a BSN or less reported higher rates of parent preference for cup feeding. This suggests that HCPs with a BSN or less are less likely to consider parental preference when determining the method of feeding in practice than HCPs with an advanced degree. This point has to be further studied to determine the reasons behind these results. A possible reason that should be investigated include lack of college education emphasizing the importance of family involvement in treatment. Higher preference and use rates regarding cup feeding in conjunction with higher knowledge scores among HCPs with an advanced degree  $\geq 10$  is consistent with the KAB model.

### **Study Hypotheses**

The results of this study reject the hypotheses of aims 1 and 2 that there are no differences in regards to feeding types knowledge and beliefs and cup feeding preference and past behavior between Jordan and US and between nurses and physicians. Study results are in support of the hypothesis for Aims 3 and 4. For Aims 3 and 4, the null hypothesis that there will be no difference in knowledge, beliefs, preference, and past behavior in relation to neonatal

experience and degree type is rejected. All predictors, country, occupation, experience, and degree type influenced outcome variables.

## **Limitations**

There are few limitations that might have potential impact on the quality of the findings of this study. These limitations include the resulting study sample, use of an online questionnaire, and institutional technologies.

Having a convenient sample generates a caution dealing with the results of this study. Despite the advantages of relatively easiness to carry out with few rules governing how the sample should be collected, the non random selection for the convenient sample creates a possible bias that may make the sample unlikely to be representative of the population; thus challenges the ability to make generalizations.

Moreover, using an online survey created sample bias. As online surveys often target participants who have internet access, and most of Jordanian internet users are of younger age, the majority of Jordanian sample age is 30 years or younger, with less neonatal experience than U.S. sample. Also, targeting nurses and physicians who are members of national and international organizations could create a bias as these participants are more likely to be more educated and more willing to learn than non-members.

One of the biggest limitations for this study is that multivariate regression analysis can't be done. The reason for that is the confounding effect of country that takes out all the effect of other predictors. The majority of Jordan sample study participants were below the age of 30 with

a BSN degree, making them less experienced, less educated sample than US sample. Also, only 18% of the samples were physicians, who already have an advanced degree.

### **Conclusions & Implications**

By describing the knowledge and beliefs of nurses and physicians in NICUs regarding feeding types of preterm infants who are unable to fully breastfeed, it was identified that HCPs, especially these with a BSN degree or less and these with less than 10 years of neonatal experience, have the least amount of knowledge and the most negative beliefs about cup feeding compared to the knowledge and beliefs regarding other feeding types. These findings can lead to interventions aimed at improving the knowledge and correcting the beliefs of NICU nurses and physicians regarding cup feeding and developing models of education and support for HCPs who work with vulnerable infants. These informed and targeted educational interventions can then improve HCPs' knowledge, skills, and attitudes in each different culture setting, and may ultimately result in better patient outcomes for some of our most vulnerable patients: preterm infants.

Neonatal HCPs in U.S. have more knowledge and more positive beliefs about preterm infant feeding, and they prefer and use cup feeding more than Jordanian neonatal HCPs. Physicians have more knowledge and more positive beliefs regarding preterm infant feeding, and they prefer and use cup feeding more than nurses. Also, more experience leads to more knowledge and more positive beliefs regarding preterm infant feeding, and lead to more preference and use of cup feeding. And advanced education leads to more knowledge and more positive beliefs regarding preterm infant feeding, and to more preference and use of cup feeding.

Additional research is needed to further investigate the variables in this study using a larger sample. Further studies are recommended to explore into the reasons of different

knowledge and beliefs between U.S. and Jordanian HCPs. In addition, further studies are recommended to explore the reasons behind having the lowest amount of knowledge and higher negative beliefs regarding cup feeding among HCPs compared to their knowledge and beliefs regarding other feeding types. Also, further studies are recommended to investigate the reasons of why Jordanian HCPs have lower amount of knowledge and higher negative beliefs regarding cup feeding than U.S. HCPs, although health institutions in Jordan, as a developing country, follow WHO guidelines when writing health care policy. As the WHO recommends cup feeding, this might have suggested an increased level of knowledge in Jordan, which was not found in this study. The questionnaire could include a question asking about the policy of feeding preterm infants in the hospital where participants work. Qualitative studies might provide valuable insight about reasons for having negative beliefs regarding cup feeding. Also, additional research is needed to compare knowledge, beliefs, and practices of HCPs in US versus HCPs in other countries, and to document cup feeding rates in these countries.

In addition, an important topic needs further investigation is the attitude regarding not including parents in choosing feeding type for preterm infants. Educational sessions for HCPs about the importance of including parents in treatment are recommended. Also, there are no reported studies that specifically explored mother's comfort levels, concerns, fears, about cup feeding; an important topic that needs to be further explored.

Furthermore, nursing and medical curriculums should be altered to include feeding for stable pre-term infants, and hospitals should be assessed regarding providing enough education for nurses about feeding preterm infants.

## **Summary**

This study has expanded the body of knowledge about HCPs' knowledge and beliefs regarding feeding types, and HCPs' cup feeding preference and use, both in U.S. and Jordan. Neonatal HCPs in U.S. have more knowledge and more positive beliefs about preterm infant feeding, and they prefer and use cup feeding more than Jordanian neonatal HCPs. Physicians have more knowledge and more positive beliefs regarding preterm infant feeding, and they prefer and use cup feeding more than nurses. Also, advanced education and more experience leads to more knowledge and more positive beliefs regarding preterm infant feeding, and lead to more preference and use of cup feeding. Further studies, with larger sample, are recommended, including qualitative studies to further explore the reasons behind the results of this study.



## APPENDIX A

### QUESTIONNAIRE

#### **Cup Feeding in the NICU: The Influence of Country, Belief, Preference, and Past Behavior**

##### **Section 1. Demographic Information.**

- 1) Today's Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_
- 2) Country:                      a) Jordan                                      b) USA                                      c) Other \_\_\_\_
- 3) Age:
- 4) Gender:                      a) Male                                      b) Female
- 5) What is your highest degree?
- a) ADN                                      b) BSN                                      c) MS/MSN
- d) DNP                                      e) DO                                      f) MD
- g) PhD                                      h) Other (please specify): \_\_\_\_\_
- 6) Which best describes you?
- a) Registered Nurse - Staff Nurse                                      b) Registered Nurse - Charge Nurse
- c) Registered Nurse - Manager/ Clinical Manager                                      d) Neonatal Nurse Practitioner
- e) Physician - Resident (Level \_\_\_\_\_)                                      f) Physician - Pediatric Fellow
- g) Physician - Neonatal Fellow                                      h) Physician - Attending Neonatologist
- i) Physician - Attending Pediatrician                                      j) Other (please specify): \_\_\_\_\_
- 7) How much experience in health care do you have (please indicate in months or years)?
- \_\_\_\_\_ years                      \_\_\_\_\_ months
- 8) How much neonatal experience do you have (please indicate in months or years):
- \_\_\_\_\_ years                      \_\_\_\_\_ months
- 9) What is your race/ Ethnicity?
- a) Arabic/ Middle Eastern                                      b) Hawaiian or Other Pacific Islander
- c) Asian or Asian American                                      d) Black or African American
- e) Hispanic or Latino                                      f) White (Non-Hispanic)
- g) Native American or Alaska Native                                      h) Mixed (describe): \_\_\_\_\_
- i) Other (please specify): \_\_\_\_\_
- 10) Have you or your partner ever breastfed?
- 11) Have you ever had a child who was born premature (<37 weeks)?
- a) N/A, never had a child                                      b) No                                      c) Yes
- 12) Do you belong to a professional organization?
- a) No
- b) Yes (circle all that apply):
- i) Academy of Neonatal Nursing (ANN)
- ii) National Association of Neonatal Nursing (NANN)
- iii) American Academy of Pediatrics (AAP)
- iv) Arab Neonatology Forum (ANF)
- v) Arab Neonatal Group (ANG)
- vi) Other (Specify \_\_\_\_\_)

13) I work in a hospital that is Baby Friendly Hospital Initiative accredited.

a) No

b) Yes

c) I don't know

14) Who do you think has the authority to make decisions regarding feeding types for preterm infants (describe)?

a) Physicians

b) Physican Assistants

c) Nurse practitioners

d) Registered Nurses

e) Parents

f) All of the above

g) Others (Specify)...

## **Section 2.**

Please read each statement below and circle the number that represents how you best feel for each item. In the questions below we are referring to a stable preterm infant born between 32 – 36 weeks of gestation who is appropriate for weight, free of major congenital anomalies/major intracranial hemorrhage, and is free of apnea requiring intervention/oxygen supplementation.

	<b>IN THE STABLE PRETERM INFANT...</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>More disagree Than agree</b>	<b>More agree Than disagree</b>	<b>Agree</b>	<b>Strongly agree</b>
1	I have the authority to decide what type of feeding to use for preterm infants.	1	2	3	4	5	6
2	I have received adequate training about NGT feeding.	1	2	3	4	5	6
3	Cup feeding is a new method of feeding.	1	2	3	4	5	6
4	Bottle feeding is never suitable for preterm infant.	1	2	3	4	5	6
5	NGT feeding does not require frequent monitoring.	1	2	3	4	5	6
6	I have strong feelings against cup feeding.	1	2	3	4	5	6
7	I have received classes on the topic of breast feeding.	1	2	3	4	5	6
8	Bottle feeding is awkward.	1	2	3	4	5	6
9	Cup feeding is never suitable for preterm infant.	1	2	3	4	5	6
10	I have received adequate training regarding breast feeding.	1	2	3	4	5	6
11	I am comfortable teaching bottle feeding to families.	1	2	3	4	5	6
12	I have strong feelings against bottle feeding.	1	2	3	4	5	6
13	Cup feeding does not require frequent monitoring.	1	2	3	4	5	6
14	I am comfortable using NGT feeding.	1	2	3	4	5	6
15	Cup feeding is awkward.	1	2	3	4	5	6
16	I have received classes on the topic of cup feeding.	1	2	3	4	5	6
17	Bottle feeding does not require frequent	1	2	3	4	5	6

	monitoring.						
18	I have received classes on the topic of NGT feeding.	1	2	3	4	5	6
19	I am comfortable teaching cup feeding to families.	1	2	3	4	5	6
20	Breast feeding is never suitable for preterm infants.	1	2	3	4	5	6
21	I have received adequate training on the topic of cup feeding.	1	2	3	4	5	6
22	NGT feeding is never suitable for preterm infant.	1	2	3	4	5	6
23	I am comfortable teaching breast feeding to families.	1	2	3	4	5	6
24	I have received classes on the topic of bottle feeding.	1	2	3	4	5	6
25	Breast feeding is awkward.	1	2	3	4	5	6
26	I have strong feelings against NGT feeding.	1	2	3	4	5	6
27	I am comfortable using cup feeding.	1	2	3	4	5	6
28	Breast feeding does not require frequent monitoring.	1	2	3	4	5	6
29	I have received adequate training on the topic of bottle feeding.	1	2	3	4	5	6
30	NGT feeding is awkward.	1	2	3	4	5	6
31	I am comfortable teaching family to perform NGT care.	1	2	3	4	5	6
32	I have strong feelings against breastfeeding.	1	2	3	4	5	6
33	Cup feeding is an easy way of providing nutrients to stable preterm infants.	1	2	3	4	5	6
34	I am comfortable assisting with breast feeding.	1	2	3	4	5	6

### **Section 3.**

Please read each sentence carefully and choose the number that best represents how you think about each item. In the questions below we are referring to a stable preterm infant born between 32 – 36 weeks of gestation who is appropriate for weight, free of major congenital anomalies/major intracranial hemorrhage, and is free of apnea requiring intervention/oxygen supplementation.

	<b>IN THE STABLE PRETERM INFANT...</b>	Never	Rarely	Some of the time	Often	Most of the time	Almost always	Always
1	Breast feeding increases nursing workload.	0	1	2	3	4	5	6
2	Cup feeding is safe for preterm infants.	0	1	2	3	4	5	6

3	Bottle feeding is associated with aspiration.	0	1	2	3	4	5	6
4	NGT feeding increases nursing workload.	0	1	2	3	4	5	6
5	Cup feeding is tiring for the preterm infant.	0	1	2	3	4	5	6
6	Breast feeding is associated with aspiration.	0	1	2	3	4	5	6
7	NGT feeding delays the transition to full breast feeding.	0	1	2	3	4	5	6
8	Bottle feeding is safe for preterm infants.	0	1	2	3	4	5	6
9	Cup feeding increases nursing workload.	0	1	2	3	4	5	6
10	Breast feeding is safe for preterm infants.	0	1	2	3	4	5	6
11	Cup feeding is associated with aspiration.	0	1	2	3	4	5	6
12	NGT feeding is time consuming.	0	1	2	3	4	5	6
13	Bottle feeding increases nursing workload.	0	1	2	3	4	5	6
14	Cup feeding delays the transition to full breast feeding.	0	1	2	3	4	5	6
15	Breast feeding is tiring for the preterm infant.	0	1	2	3	4	5	6
16	Cup feeding is recommended when breast or bottle feeding is difficult.	0	1	2	3	4	5	6
17	NGT feeding is safe for preterm infants.	0	1	2	3	4	5	6
18	Bottle feeding increases work of breathing compared to breast feeding.	0	1	2	3	4	5	6
19	Cup feeding is time consuming.	0	1	2	3	4	5	6
20	Bottle feeding delays the transition to full breast feeding.	0	1	2	3	4	5	6
21	Cup feeding is recommended for stable preterm infants who are able to swallow but cannot suckle.	0	1	2	3	4	5	6
22	NGT feeding is associated with aspiration.	0	1	2	3	4	5	6
23	Cup feeding increases work of breathing compared to breast feeding.	0	1	2	3	4	5	6
24	Cup feeding is a practical alternative feeding method.	0	1	2	3	4	5	6
25	Breast feeding is time consuming.	0	1	2	3	4	5	6
26	Cup feeding allows the infant to control amount/rate of feeding compared to bottle feeding.	0	1	2	3	4	5	6
27	Bottle feeding is tiring for the preterm infant.	0	1	2	3	4	5	6
28	Cup feeding can be used even if the preterm infant is still having the majority	0	1	2	3	4	5	6

	of his/ her nutrition by tube.							
	<b>IN THE STABLE PRETERM INFANT...</b>	Never	Rarely	Some of the time	Often	Most of the time	Almost always	Always
29	Cup feeding is associated with gastroesophageal reflux.	0	1	2	3	4	5	6
30	Bottle feeding is time consuming.	0	1	2	3	4	5	6
31	Cup feeding encourages coordinated breathing, sucking/ lapping, and swallowing.	0	1	2	3	4	5	6
32	Cup feeding leads to good weight gain.	0	1	2	3	4	5	6

**Section 4.** In the questions below we are referring to a stable preterm infant born between 32 – 36 weeks of gestation who is appropriate for weight, free of major congenital anomalies/major intracranial hemorrhage, and is free of apnea requiring intervention/oxygen supplementation. For each of the items below, rank all items in order of your preferences or beliefs.

- 1) Rank feeding types below in relation to **being a practical alternative to breastfeeding** from 1 (least) to 3 (most). Rank the feeding type that you consider the LEAST practical alternative to breast feeding a 1 and the feeding type that you consider the most practical alternative to breast feeding a 3. Enter 1 (least), 2, and 3 (most).

\_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 2) Rank feeding types below based on how much it helps **an infant advance to breastfeeding** from 1 (least) to 3 (most). Rank the feeding type that you consider the least helpful a 1 and the feeding type that you consider the most helpful a 3. Enter 1 (least), 2, and 3 (most).

\_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 3) Rank feeding types below based on which **increases** an infant's **heart rate** the least (1) to the most (4). Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 4) Rank feeding types below based on which **tires** an infant the least (1) to the most (4). Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 5) Rank feeding types below in relation to **breathing load** from 1 (least) to 4 (most). The feeding type that increases breathing load the least receives a 1 and the feeding type that increases breathing rate the most a 4. Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 6) Rank feeding types below based on which **decreases** an infant's **oxygen saturation level** from the least (1) to the most (4). Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 7) Rank feeding types below based on **energy expenditure** from 1 (least) to 4 (most). The feeding type that requires an infant to expend the least amount of energy would receive a 1 and the feeding type that requires an infant to expend the most amount of energy a 4. Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 8) Rank feeding types below based on which **leads to the quickest infant weight gain** from least (1) to the most (4). Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 9) Rank feeding types below in relation to the amount of **time required to feed an infant**. Rank the feeding type that requires the least amount of time to feed an infant a 1, and the feeding type that requires the most amount of infant feeding time a 4. Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 10) Rank feeding types below in relation to influence on **nurse work load**. The feeding type that has the least amount of influence on nurse work load receives a 1 and the feeding type that increases nurse workload the most a 4. Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 11) Rank feeding types below in relation to infant aspiration. The feeding type that is related to the least amount of **aspiration** receives a 1, and the feeding type that is related to the most amount of aspiration a 4. Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 12) Rank feeding types below based on which **enhances parental attachment** from the least (1) to the most (4). Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

- 13) Rank feeding types below based on which type **enhances parent feeding participation** from the least (1) to the most (4). Enter 1 (least), 2, 3, and 4 (most).

\_\_\_\_ Breast                      \_\_\_\_ Bottle                      \_\_\_\_ NGT                      \_\_\_\_ Cup

## **Section 5.**

In the questions below we are referring to a stable preterm infant born between 32 – 36 weeks of gestation who is appropriate for weight, free of major congenital anomalies/major intracranial hemorrhage, and is free of apnea requiring intervention/oxygen supplementation.

- 1) In terms of feeding stable preterm infants, at my hospital, breastfeeding is usually:  
a) Strongly discouraged      b) Somewhat discouraged      c) Neither encouraged nor discouraged  
d) Somewhat encouraged      e) Strongly encouraged
  
- 2) Have you ever heard about cup feeding before?  
a) No      b) Yes      **(If no, go to #8)**
  
- 3) Have you ever cup fed a stable preterm infant?  
a) No      b) Yes      **(If no, go to #8)**
  
- 4) How often do you cup feed a stable preterm infant?  
a) Never      b) < once/year      c) Three times/year      d) Every other month  
e) Once/month      f) Every other week      g) Once/week      h) Every other day      i) Once/day
  
- 5) In general, what is your level of success when cup feeding a stable preterm infant?  
a) Not successful      b) Somewhat successful      c) Successful      d) Very successful      e) Extremely successful
  
- 6) In general, how often do you teach parents to cup feed their stable preterm infant?  
a) Never      b) < once/year      c) Three times/year      d) Every other month  
e) Once/month      f) Every other week      g) Once/week      h) Every other day      i) Once/day
  
- 7) In general, after education, how successful do you think that parents cup feeding their stable preterm infant?  
a) Not successful      b) Somewhat successful      c) Successful      d) Very successful      e) Extremely successful
  
- 8) In general, do you think parents prefer cup feeding over NGT feeding?  
a) No      b) Yes
  
- 9) I would consider cup feeding a stable preterm infant.  
a) No      b) Yes

**Do you have any comments? If yes, specify please.**

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## APPENDIX B

### CONSENT FORM

#### Online Survey Consent Form

You are being invited to participate in a research study titled **Cup Feeding in the NICU: The Influence of Country, Belief, Preference, and Past Behavior**. This study is being done by **Sameh Ghareeb** from the University of Massachusetts Amherst. You were selected to participate in this study because **you have the experience of feeding, or recommended a type of feeding, stable preterm infants**.

The purpose of this research study is to identify the knowledge, belief, preference, and past behaviors of health care team in NICU regarding the different types feeding. If you agree to take part in this study, you will be asked to complete an online questionnaire. This questionnaire will ask about **your demographic information and will have questions about breastfeeding, cup feeding, nasogastric tube feeding, and bottle feeding** and it will take you approximately 30 minutes to complete.

You may not directly benefit from this research; however, we hope that your participation in the study may **lead to interventions aimed at improving the knowledge of NICU nurses and physicians regarding types of feeding and developing models of types of feeding education and support for health-care providers who work with vulnerable infants**.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by **protecting the data through coding, hiding of identifying information, and limiting access to the data and it will not used for purposes other than those of the study**.

Your participation in this study is completely voluntary and you can withdraw at any time.

If you have questions about this project or if you have a research-related problem, you may contact the researcher, **Sameh Ghareeb** at [sghareeb@nursing.umass.edu](mailto:sghareeb@nursing.umass.edu). If you have any questions concerning your rights as a research subject, you may contact the University of Massachusetts Amherst Human Research Protection Office (HRPO) at (413) 545-3428 or [humansubjects@ora.umass.edu](mailto:humansubjects@ora.umass.edu).

By clicking “I agree” below you are indicating that you are at least 18 years old, have read and understood this consent form and agree to participate in this research study.



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